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THE
GEOGRAPHICAL REVIEW

VOL. IX JANUARY, 1920 NO. 1

EXPLORATIONS IN THE LOP DESERT

By SIR AUREL STEIN, K.C.I.E., &c.

The journey to be described in these pages formed part of an extended trip undertaken under the auspices of the Indian government which during three years (1913-1916) carried me through the whole length of Central Asia, from Kashmir to the ancient Great Wall of China and back again to India across Turkestan and the eastern borderlands of Persia.* A brief account of it may serve to illustrate the geographical and archeological aims for the sake of which I returned to the dreary region where the Tarim River, and with it the united drainage of the huge basin of Chinese Turkestan, finally loses itself amidst wastes of dried-up salt marsh, bare clay, and drift sand.

Ever since my first visit to the Lop Desert in the winter of 1907, described in my "Ruins of Desert Cathay," the fascination of the region had drawn me. There were problems of distinct geographical interest, connected with the question of the "desiccation" of innermost Asia, to be studied in that desert depression, some 300 miles from east to west and about half the distance across, between the foot of the Altin-tagh, a range belonging to the Kwenlun system, on the south, and the barren hills of the Kurnuk-tagh, an outpost of the Tian-shan, on the north. Most of the ground still remained unexplored.

Equally attractive to me was the hope that I might find there ruined sites long ago abandoned to the desert and that they might yield to the spade more relics of that ancient civilization which, as the joint product of Indian, Chinese, and Classical influences, had once flourished in the Tarim Basin and upon which it has been my good fortune to throw light by my former explorations. Chinese historical records show that through those dismal and now wholly waterless tracts had once passed an important trade route, by which in the first centuries before and after the commence-

* A preliminary account of the whole journey, with map in 1:7,500,000, appeared in the *Geogr. Journ.*, Vol. 48, 1916, pp. 97-130 and 193-229.

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ment of our era China secured its earliest direct contact with Central Asia, India, and the distant West. To trace this route right through over ground as yet unexplored was a task which by its combined geographical and historical interests forcibly appealed to me.

Work in the Lop Desert would be possible only during the few winter months when the severe cold permits of the carriage of water in the convenient form of ice. So, ever since my start from Kashmir at the end of July, 1913, I had been obliged to travel and work at high pressure in order to arrive in good time. By dint of constant exertions I had managed to accomplish the journey of some 2,200 miles across little-known portions of the ice-clad Hindukush ranges, the Pamirs, and along the whole length of the great Takla-makan Desert, that true "sea of sand," in a little over five months, and at the same time to carry out what new explorations my routes offered a chance for.

Entrance into the Lop Region

On January 8, 1914, I arrived at Charkhlik (map, Fig. 1) together with three of my Indian assistants. A few days later I had the satisfaction of being rejoined by Rai Bahadur Lal Singh, my faithful old travel companion from the Survey of India, who during a separation of nearly four months had been effecting important surveys along the high main range of the Kwenlun. It was at that little oasis, the only settlement of any importance in the Lop region, that I had to procure the whole of the supplies, labor, and extra camels which our several parties would need in the desert eastwards.

I found the difficulties of this task greatly increased by a local upheaval, characteristic of the troubled conditions of Chinese Turkestan, which had just preceded my arrival. It was a queer story, this irruption of a band of Chinese "revolutionaries," *recte* bandits, from Charchan who, without interference from the Turki Mohammedan population, had murdered the local Chinese magistrate and set up their leader as *amban* in his place, only to be within a week surprised and killed in turn by a party of Tungan troops in the pay of the provincial "government." All Chinese civil authority had disappeared, without which no effective help could be hoped for from the easy-going Lopliks and their indolent *begs*. The passage of fresh bodies of Tungan troops threatened completely to exhaust what slender supplies the two hundred homesteads of Charkhlik still retained.

Archeological Work at Miran

After six days' anxious stay at Charkhlik we transferred our base to Miran, two long marches away to the east, the last spot of cultivation on that lonely track through the "Desert of Lop" which Marco Polo followed about 1273 on his one month's caravan journey to Sha-chou, or Tun-huang,

on the westernmost border of China proper. In 1907 I had made important discoveries there among ruins which mark the site of the earliest capital of the Kingdom of Shan-shan or Lou-lan, as the Chinese annals

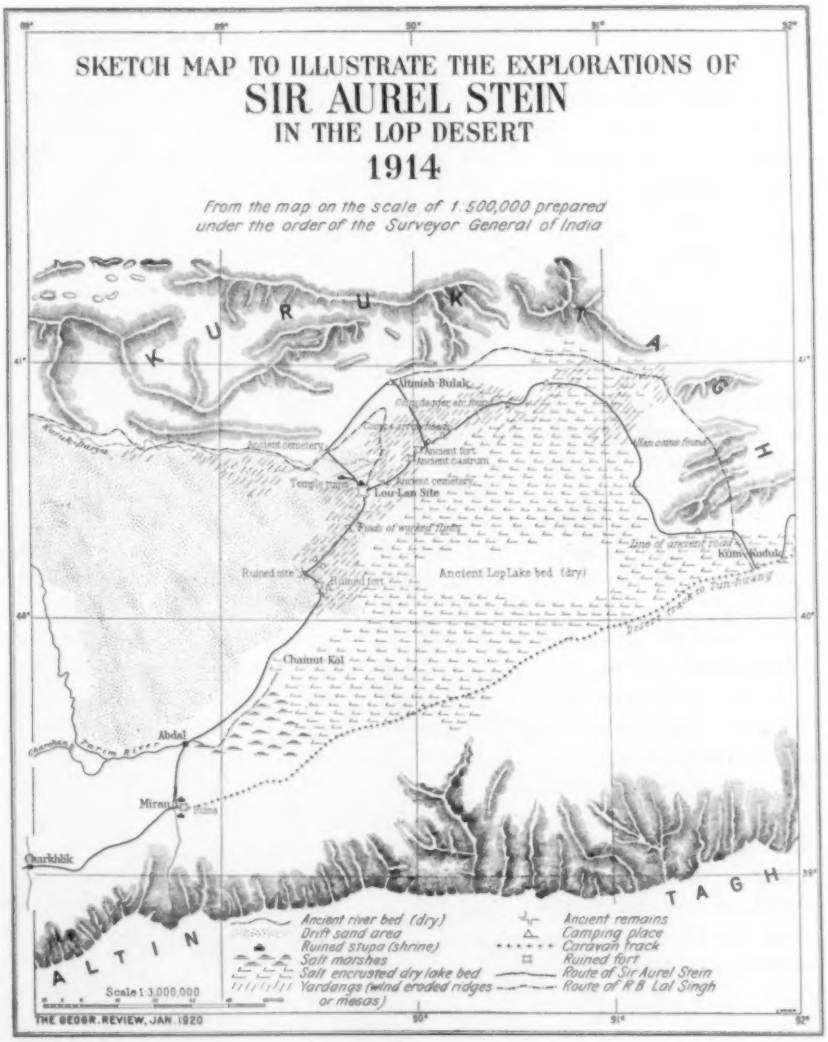

FIG. 1

call it, corresponding to the present Lop region. From two ruined Buddhist shrines, dating from the early centuries of our era, I had brought to light wall paintings of supreme artistic interest, strikingly reflecting the

FIG. 2—Interior of ancient fort with wind-breached portion of rampart, southwest of Lou-lan site. Heavy timber débris in foreground marks position of completely eroded structure. (All photos by the author.)

influence of the Greco-Buddhist art of the northwestern frontier of India, and some almost Hellenistic in character. Owing to shortness of time and technical difficulties we had then been able to remove the frescoes from only one of these temples. The recovery of what survived in the other temple proved a very delicate task. The icy blasts which almost constantly sweep across the bare gravel glacis at the foot of the Altin-tagh made the work particularly trying. But in the end we succeeded in removing and packing with all needful care for their long journey to India the friable plaster panels of the fine frescoed dado with its cycle of youthful figures, set between graceful garland-carrying putti.

Strange, indeed, seemed the contrast between the pleasures of life, symbolized on these crumbling walls by some modest artist from the far-off Hellenized East, and the lifeless desolation of the ruined site as it now is. But it impressed itself even more strongly upon me through the manifold anxieties and cares which attended my fortnight's labors at Miran. I knew that a timely start was essential for the execution of the explorations I had planned in the waterless desert north and northeast of the present Lop-nor marshes. It was certain that without adequate transport and supplies it would be impossible to effect the whole of my program or even to transport my heavy baggage by the desert track towards Tun-huang.

Preparations for the Desert Journey

For the sake of my proposed excavations I needed to take a comparatively large party of laborers into the desert, and my own fifteen stout camels would not have sufficed merely for the carriage of the ice which was to keep us all supplied with the minimum provision of water and still less for that of the indispensable food and equipment. In the disturbed state of affairs at Charkhlik it had been impossible to secure hired camels besides the seven I managed to bring from Charchan. My supplies for men and beasts during a minimum of two and a half months were equally far from completeness.

Amidst all these preoccupations there appeared unexpectedly, as we were at work at the ruined temple, Sher Ali Khan, an enterprising Pathan trader from Bajaur, now on his way to Khotan with silk and tea from distant Szechwan. I greeted his burly figure clad in heavy furs with delighted surprise. Seven years before I had met him at Tun-huang, and, as an old acquaintance and mindful of what he owed to the *sircar* as an Indian subject, he was eager to help.

In his caravan were ten hired camels from Tun-huang which, after a good rest, might become fit for facing the long journey back under loads. In addition, the lucky encounter enabled me to confide to the care of this trustworthy merchant the heavy cases with frescoes and other antiques which my excavations at Miran had yielded, for safe transport to the

British Consulate at Kashgar, some two months' caravan journey westwards.

It was of some advantage, too, that the dozen families of Lopliks, who formerly dwelt at Abdal, near the marshes of Lop-nor, as semi-nomadic fishermen and hunters, had since 1908 transferred their homesteads to the patches of land now again after centuries of abandonment irrigated from the stream of Miran. The fact of their transformation into casual agriculturists made it easier to secure from among them laborers, together with a few camels and some additional supplies.

FIG. 3—Remains of ruined *stupa*, or shrine, on wind-eroded terrace, Lou-lan site. (Naik Shams Din in middle of ruined mound.)

On January 23 I started Lal Singh to Tikenlik, a small Lop colony seven marches northward by the terminal course of the Tarim. There, if all went well, he would pick up the seven strong camels I had asked Abdur Rahim, the hardy hunter from Singer and my old guide of 1907 in the Kuruk-tagh, to provide. From Tikenlik Lal Singh was to carry out a survey of the ancient dry river bed and its branches by which the waters of the Konche-darya once reached the area, now wholly desiccated desert, south of the Kuruk-tagh foothills. There Sven Hedin had discovered in 1900 the ruins of the "Lou-lan" site which seven years later yielded me abundant archeological spoil, and there was to be our rendezvous.

Some days after Lal Singh's departure I sent off Muhammad Yakub Khan, my second Indian surveyor, by the desert track leading to Tun-

huang, in order to carry a series of exact leveling operations from the northeastern end of the great salt-encrusted basin which marks the ancient dried-up Lop Lake, to the point where, I believe, the drainage of the Su-lo Ho coming from the far-off Nan-shan ranges had once joined it.

My own tasks included the excavation and clearing of any ruins which might be revealed by the exploration of the dried-up delta of the Kuruk-darya, or "Dry River," and the search for the ancient Chinese route once leading eastward from Lou-lan. Adequate time had to be assured for the latter rather hazardous task and for the survey of the unexplored northern

FIG. 4—Ruined dwelling on wind-eroded terrace, with *stupa* ruin on right, Lou-lan site. (Laborer on top of terrace marks original ground level.)

and eastern portions of the great salt-encrusted lake bed which, there was reason to assume, that ancient route must have passed through or skirted. All this would have to be done before the winter cold broke up or the staying power of the camels, on which everything depended, became exhausted.

What with big loads of ice sufficient to assure minimum allowances of water for thirty-five people for at least one month; with food supplies for one month for all and for an additional month for my own people; and with the indispensable outfit of tents, furs, felts, etc., to afford protection in the wintry desert exposed to freezing gales, the thirty camels I had succeeded with great difficulty in procuring, including my own, were by no means too many. It goes without saying that everybody had to walk and that the twenty-five laborers taken had to help by the carriage of light loads.

Native Personnel of the Party

Most of them were hardy Lopliks, inured to privations and exposure in the desert by generations of semi-nomadic existence and yet accustomed, too, by the recent change in their condition of life to wielding the *ketman*, or hoe, that excellent implement of the Turkestan digger. I also had the support of my trusted old Loplik follower, Tokhta Akhun. First employed by Sven Hedin, he had previously proved most useful to me by his pluck and his instinct of the born hunter of wild camels. A curious contrast to him was Hassan Akhun, my quicksilvery head cameleer from Kashgar, with whom readers of my former personal narratives, "Sand-Buried Ruins of Khotan" and "Ruins of Desert Cathay," have become acquainted. To no one could I have entrusted the care of the brave camels with more confidence than to him. Ever quarrelsome, full of conceit, and the possessor of a terribly sharp tongue, the small but wiry fellow was a very difficult person to manage on ordinary caravan journeys and still more so when near the temptations of bazars in villages or towns. But he possessed all the knowledge and skill of the born cameleer which only inherited instinct and long early training can give. It was he who had selected for me from the summer grazing grounds in the outer hills south of Khotan the fifteen fine camels which were to be my "ships of the desert" on this journey.

His staff was completed by his nephew, young Mahmud, a chubby and rather phlegmatic boy, and by Mahmud "the big," a quiet young Khotanese whom I had transferred from Lal Singh's party and who in time learned to accommodate himself to his imperious "skipper's" ways.

January 31 was my last day at Miran and a terribly busy one. Short as we were of camels, fresh trouble had arisen two days before by two of our own having strayed from the scrubby jungle belt near the Miran stream. They had been tracked into the desert towards Charkhlik, and search parties had to be organized to secure them if possible.

Start of the Desert Journey

The next morning I had the satisfaction of seeing my large column started at last for the desert northeastward. It had cost great efforts to organize it at this last humble outpost of Turkestan civilization, and the trouble and pressure involved had, no doubt, been felt by the easy-going Lopliks; but, when the leave-taking was all done and rewards had been duly deposited, I could see in their honest Mongolian faces only the reflection of kindly feelings and good wishes for my success. Rarely had the Turki farewell, "*Yol bolsun*" ("May there be a road"), sounded in my ears so pregnant with meaning.

There was delightful peace and a sense of nature still alive in the belt of thickly growing wild poplars through which our track first led along the dying course of the Miran stream. Then we passed into a zone of

somber tamarisk-covered sand cones, typical of the true desert margin in the south of the Takla-makan, and finally, crossing a dismal expanse of absolutely bare salt-impregnated plain, reached the bank of the Tarim by nightfall. A little cluster of mud hovels and reed huts marked the abandoned fishing hamlet of Abdal. But one of these had been kept habitable by Tokhta Akhun and, fitted for the occasion with warm felt rugs, offered welcome shelter for my first good night's rest after many anxious weeks.

The nights were still bitterly cold—during one of them the minimum thermometer registered —12° F., and a strong sheet of ice covered the deep but narrow channel through which the Tarim in its sluggish terminal course empties itself below Abdal into the marshes and lagoons of Lop-nor; and so the crossing of our many camels with their loads to its north bank could be effected with ease in the morning. It was strange to feel that in crossing those forty yards of ice we had passed over all that was left of the waters, so extensive in spring and summer, which the glacier-clad high ranges of the Kwenlun, the eastern Pamirs, and the Tian-shan send down into the huge Tarim Basin.

A cloudy sky and the dust haze raised by the bitter northeast wind blowing into our faces made the ground traversed in the day's march look even more lugubrious than it was by nature. A succession of dreary reed-covered marshes on our right fringed the course of the dying Tarim, while northward extended a bare sandy plain with thin scrub and scanty tamarisk-crowned sand cones, the slow growth of centuries along the edge of the true desert of drift sand. Far away were dimly seen the soft outlines of its yellow big dunes. We followed a well-marked track of Loplik fishing parties and hunters, and in the late afternoon it brought us to a string of small lagoons fed by the spring floods of the Tarim, the last place where we could find good ice to carry into the desert.

The ice was nearly a foot in thickness and tasted perfectly fresh, though the water was very brackish and scarcely drinkable for men. All through the night the ice cutting and packing continued by the light of bonfires, and by dawn next morning forty-three bags were ready. They had been tied under Hassan Akhun's expert direction to those *shotas*, or pairs of short ladders, which throughout Turkestan serve for the convenient carriage of camels' loads. When at last the convoy was started, with all camels heavily laden and twenty carrying ice, progress was necessarily slow. All day we passed between or across dry lagoons, covered with a thin crust of salt, or *shōr*, which on my march to Lou-lan in December, 1906, had still held water. The total absence of live vegetation near these lake beds was striking, as if the hardy reeds and tamarisks of the desert edge had been too wary to plant themselves near such short-lived inundations of the dying river. It is different with the fish, as Tokhta Akhun explained from long experience. Having been carried into these depres-

FIG. 5—Wind-eroded clay ridges (*yardangs*) with remains of ruined dwelling in fore, Lou-lan site.

sions whenever exceptional spring floods fill them at intervals, they remain behind while the channel that brought the fresh water gradually dries up. As the water left in such lagoons gets more and more brackish, the fish rise nearer to the surface and are then caught with ease by the Lopliks.

Nature of the Country Traversed

Next morning we set out for our immediate goal, a ruined fort in the desert northward which Tokhta Akhun had sighted, apparently in 1910, when he returned from the Lou-lan site after guilding thither Mr. Tachibana, the young Japanese explorer. On the morning of February 4 I started my caravan with confidence. The atmosphere had cleared with the rapidity characteristic of the desert winter, and, as if to assure me of the accuracy of our plane-table survey, there showed clearly about eighty miles away to the south the snow-covered Kwenlun range.

The ground traversed on the day's march was still easy, permitting the camels in spite of their heavy loads to maintain a steady rate of two miles an hour. The succession of wide shallow lake beds which we crossed or passed by showed signs of having dried up recently. Only boggy patches remained, and at one point some small pools. Their water was so salt that no ice had formed over them. Towards the end of the march we came upon the first patches of ground cut up by the erosive action of the wind into small clay ridges with shallow trenches between, all running from east-northeast to west-southwest. They were the familiar *yardangs* of the desert round the Lou-lan ruins (see Fig. 5).

I did not feel sorry when the troublesome belt of *yardangs* gave way again to a wide dry lake bed with patches of reeds and low thorny scrub growing on its northern edge. It was the last chance of some grazing for the camels, and not without good reason had Tokhta Akhun chosen the spot for the night's camp. A group of high sand cones covered with thick tamarisk growth mostly dead served him as a convenient guiding point and now furnished some shelter for the men and abundance of fuel for the camp fires. The first distribution of ice was made that evening by Naik Shams Din, my "handy man" from the Bengal Sappers and Miners, to everyone in our large party. All the men had been made to bring their main food supplies in the shape of ready-baked small loaves of bread; and so the daily issue to them of ice could be limited to a quantity sufficient to provide about three pints of water for the jug of tea required by each one in the evening and again in the morning.

An early start was assured the next morning. Climbing, as soon as the sun rose, a big tamarisk cone some forty feet high, I had the satisfaction of sighting through a powerful binocular the ruin we were bound for far away on the hazy horizon. The ground crossed as we steered towards it was desolate in the extreme. Not a trace of living vegetation survived

on the expanse of bare clay which the erosive action of wind had cut up into an unending succession of steep terraces separated by trenches and troughs. Their direction, invariably running east-northeast to west-northwest as elsewhere throughout the Lop Desert, showed plainly how the prevailing winds have during countless ages swept down from the cold uplands of southern Mongolia into the depressed Lop-nor basin.

Prehistoric and Historic Finds

Forewarned by experience on my former journey I had told the men to keep a close lookout for relics exposed by wind erosion, and scarcely had we covered six miles in our weary tramp across *yardangs* when the first stone implement, a flint arrowhead, was picked up under my eyes. The promised small rewards, promptly paid, made everybody keen for this hunt, and the finds increased so rapidly that I had my hands and pockets soon filled with them.

All kinds of simple implements of the Stone Age were represented among these finds, the small saws, knives, and scrapers of Paleolithic man, as well as stone arrowheads and celts of a more advanced stage. Potsherds, too, of Neolithic type soon appeared in plenty. There could be no doubt that we were passing across a belt which in prehistoric times must have been regularly inhabited. Presently we picked up a well-preserved Chinese copper coin of the type which was common under the Han dynasty immediately before and after the beginning of our era.

As more coin fragments of the same type followed it was clear that occupation had here continued into the earliest historical period as yet traceable in the Lop-nor region. Then we came upon a broad bed running west to east, shown unmistakably as that of a river by its uniform depth, its winding banks, and the rows of dead *toghraks*, or wild poplars, which lined them. Shriveled and bleached by centuries of exposure, some of the gaunt trunks still stood upright.

Exploration of a Ruined Fort

A mile farther on we reached the ruined fort (Fig. 2). Its ramparts, forming a square of about 200 yards, rose boldly above the ground outside, which erosion had cut up and lowered in places fully fifteen feet below the original level. Their solid construction in layers of brushwood fascines and wild poplar trunks alternating with layers of stamped clay, fully 32 feet wide at the base, would alone have sufficed to assure me of the antiquity of the ruin; for it was the same system which I had found before in all fortified posts and stations built by the Chinese on their first advance into the Tarim Basin. Rapidly we unloaded the camels and stacked their precious loads of ice under the north wall of the fort where its foot, partially undercut by wind erosion, offered shade and protection from the

FIG. 6

FIG. 7

FIG. 6—Interior of ancient Chinese fort, with ramparts built of reed fascines. (Top of débris-covered mound marks original ground level before wind erosion.)

FIG. 7—Wind-eroded clay ridge, northeast of Lou-lan site, bearing remains of ancient fort.

midday sun. Then Afrazgul, with Niaz Pawan, a young Loplik hunter, and two camels carrying light loads of indispensable food, ice, and kit, was despatched westwards to reconnoiter a second small fort which Tokhta Akhun had reported and to search for more ruins along the ancient river course we had crossed.

I lost no time in exploring the fort. It was marked by foundation beams, some of them thirty feet in length, indicating a structure of a very solid type. Portions of the wall were built of timber and plaster. Wherever breaches occurred in the walls sand had entered and much sand-blasting had been done. The eastern wall was well preserved, for much drift sand had collected in the leeward side of the rampart, filling the rooms here to a height of seven feet and more. This heavy cover of sand had preserved the internal arrangements, such as sitting platforms, fireplaces, carved posts supporting the ceiling, in good condition.

The doors by which the rooms communicated with each other were still in their places, with folds ajar, just as the last occupants had left them. One still retained the coarse string intended for its fastening. One of the rooms, in which we found a small clay-built platform with its top reddened by fire and close by a roughly carved wooden trough probably used as a cooling tank, had evidently been tenanted by a blacksmith. Fragments of large jars in coarse pottery and of a few iron instruments had been left behind; but otherwise there was a curious absence of signs of continuous occupation.

Everything pointed to the little fort's having probably been intended to serve as a station on the direct route connecting the Lou-lan settlement with Miran, the ancient capital of the Lop region. There was an absence of agricultural implements and of indications of local cultivation, the straw in the plaster of the walls was all of reeds, and all the timber was of riverine jungle. Owing to its distance from cultivated ground the site had been occupied only at intervals. Our survey proved that it lay on the straight line leading from Miran to Lou-lan, almost exactly halfway between the latter and the nearest point on the Tarim. The Chinese copper coins and other small metal objects which the men picked up in numbers on eroded soil near the fort left no doubt of its dating back to the early period of Chinese occupation in the first centuries of our era.

Excavation of a Near-by Ruined Site

Soon Afrazgul returned from his reconnaissance bringing good news. Northwest of Tokhta Akhun's second ruined *kurghan* he had come upon a scattered group of small ruins, unmistakably those of houses, where he found coins, beads, and other small objects. Leaving Afrazgul behind to make an accurate plan of the large fort, I moved out next morning with my posse of diggers to the new field of work.

Tokhta Akhun's second *kurghan* proved a small circumvallation of the same type, measuring inside some 70 yards by 46. In spite of the solid construction in which courses of tamarisk fascines alternated with thicker layers of clay, the destructive force of erosion had here, too, completely effaced the northeastern portion of the ramparts. No trace of any structural remains in the interior could be found. But within the southeastern corner a small area of the ground had received protection by a thick deposit of refuse, consisting mainly of reed straw and dung. Evidently at one time the place had been used as a shelter by shepherds.

As the men proceeded to dig away at the litter there emerged abundant rags of felt and coarse fabrics in wool and linen, together with a few pieces of silk, one showing a neat knot-dyed pattern. I had told the diggers to look out carefully for any fragments of paper, with the promise of a good reward for any piece that might show writing. There was no little excitement when there went up the first shout of "*khat!*" (i. e. writing). It was a tiny piece of thin paper, only about two inches square. But, as I unfolded it with fingers half benumbed from the cold northeast wind, I recognized to my great delight a few characters recalling the old Aramaic-like script of which the few Early Sogdian documents first discovered by me in 1907 at the Lou-lan site and on the ancient Chinese border line of Tun-huang had so far remained the only known specimens.

Three miles farther on, across troublesome *yardangs* and low dunes, there was an ancient river bed clearly marked by dead *toghrak* trunks and, on either bank, appeared widely scattered the skeleton-like remains of half-a-dozen ruined structures. In each case they occupied the top of steep terraces of clay, resembling small islands which wind erosion had carved out from what was once the level area of houses.

It was clear that the erosive action of wind-driven sand had worked terrible havoc here, and when I approached the first ruin it did not surprise me to find that the wattle-and-timber wall still surviving of the large central hall rose only two feet or so above the ground. But fortunately a thick refuse layer had helped to protect the original floors here and in portions of the rooms once adjoining.

As soon as we began to clear it there emerged pieces of fine colored rugs and other fabrics in abundance from beneath reed straw, camel dung, and the like. Soon there followed Chinese paper documents, one quite large, and a fragment of a text beautifully written in that modification of ancient Indian script known as Central Asian Brahmi. When at last there appeared a small wedge-shaped record on wood in an early Indian language and the same Kharoshthi writing which I knew so well from hundreds of wooden documents of the third century A. D. unearthed at the Niya site in the south-central Takla-makan, there remained no possible doubt about the early date of these ruins and the civilization to which they belonged.

Interesting finds, too, of small objects of personal or household use came

FIG. 8

FIG. 9

FIG. 8—Clay terraces marking shore line towards eastern end of ancient Lop lake bed.
FIG. 9—Ancient salt-encrusted lake bed north of Kum-kuduk. Patch of actual salt bog shows up white.

to light in plenty, closely agreeing in type with those recovered before from the Lou-lan site. There were strips of brocade and pieces of a bag in many-colored silk; fragments of a richly ornamented headpiece with bridle in leather and bronze; a finely carved wooden cup and bowl; two large eating trays of wood, etc. From a sheltered corner there turned up in quick succession four large boards beautifully lacquered in Pompeian red and decorated with bronze studs which must have formed originally part of a box, besides many other objects of smaller size, such as an arrow shaft, spindle, bone spoon, etc. In the central hall the massive wooden pillar, about 15 feet long, which had carried the roof, lay athwart the floor; and, owing to the protection provided by a raised sitting platform on one side, the boldly carved double bracket in wood with fine volutes which had once surmounted it was recovered in perfect condition. Encouraged by well-earned rewards the men worked their *ketmans* with zeal.

Those houses where rubbish heaps had helped to ward off erosion from the original floors yielded more relics of interest, including paper documents in Chinese and ancient Indian scripts. The discovery of a well-preserved record containing ten lines of neatly written Early Sogdian text rejoiced me greatly; for, apart from its philological value, it confirmed my identification of the tiny fragment already unearthed. At other ruins, where the force of erosion had swept the ground bare except for the heavy timber and any hard débris, we had to be content with remains of architectural carvings, of miscellaneous objects in metal and stone, of fragments of pottery, glassware, and the like. To give some idea of the destructive power of the slow but unceasing erosive agency at work, it may be stated that at one of the badly attacked ruins I found the adjoining ground scooped out to a depth of fully 22 feet below the original level.

The antiquarian evidence obtained sufficed to establish the essential fact that the settlement, probably agricultural in part, had been occupied down to the beginning of the fourth century of our era, and by people sharing the same civilization, due to the mixture of Indian, Chinese, and Western influences, which my finds of 1906-1907 at Lou-lan and Miran had illustrated. A variety of physical features observed in the immediate vicinity of the ruined settlement threw fresh light, too, on the hydrography and early occupation of this now waterless part of the Lop-nor region during historical times and those immediately preceding them. For the latter the abundant finds of stone implements such as Neolithic arrowheads and jade celts, which we picked up from the eroded surface of the ground near these ruins, afforded safe guidance.

Sojourn at the Lou-lan Site

I now turned towards the main Lou-lan site which I intended to make my base for our next explorations. Leaving behind the heavier antiques

to be picked up later, I started my column in the early morning of February 9 for the new goal.

Our crossing was favored by an atmosphere of unusual clearness for this wind-swept desert; and, when after a tramp of close on twenty miles we pitched camp in a belt of ancient riverine jungle, the glorious evening light seemed to diffuse warm life and beauty over this strange landscape in spite of the deathlike torpor in which it has lain for centuries. Far away to the north showed up the reddish crest line of the barren Kuruk-tagh hills. Its sight raised the spirits of the men quite as much as the roaring camp fires which the abundance of ancient firewood allowed them to keep up.

We had not marched more than five miles the next morning when the appearance on the bare eroded soil of fragments of bronze ornaments and glassware, soon followed by Chinese copper coins of the Han type, proved that we had entered that belt of the ancient delta to which occupation in the early centuries of our era extended. That the bare clay of the ground became more and more a close maze of steep ridges and furrows was another indication of our nearing the Lou-lan ruins. At last, climbing with Tokhta Akhun to the top of an isolated dead tamarisk cone, I sighted far away, and only a few degrees out of the bearing we had tried to steer, the ruined *stupa* tower which I remembered as the landmark of the main site of Lou-lan.

During the next three days we were kept busy at this ancient station. The varied finds of antiques and documents which our explorations yielded made it certain that the ruined site, though small in size, had served as an important administrative post on that ancient route by which Chinese commercial and political expansion first penetrated into Central Asia at the close of the second century before Christ. The difficulties of this desert route, owing to the want of water over a great portion of it, must always have been very serious; and early in the fourth century A. D., as the critical examination of the Chinese manuscript finds from the site made by M. Chavannes, my distinguished Sinologue collaborator, clearly shows, it was deserted altogether. From the archeological evidence collected by me, it is safe to conclude that about the same time the settlement of which the Lou-lan site was the chief place was finally abandoned to the desert. It seems probable that the event was directly connected with the drying up of the ancient river bed of the Kuruk-darya, which previously had carried the waters of the Konche-darya, now absorbed by the Tarim, to the settlement and upon which its existence must have wholly depended.

To search for the line of the ancient Chinese route eastward beyond the Lou-lan station and for any remains which might be found along it was the main task which had brought me back to this forbidding desert. It was only towards the end of my previous visit in 1906 that the extensive rubbish heaps, covering the ground around what had been the administra-

tive headquarters, or *yamên*, of the old Chinese station, revealed themselves in their true meaning as mines of records of all sorts thrown out as "waste paper." A further number of ancient documents on wood and paper were now recovered. Chinese records formed the great majority; but our careful search brought to light also Kharoshthi tablets, some showing the oblong official shape evidently connected with the indigenous administration, and a complete letter in the same early Indian script written on a piece of silk which had subsequently been sewn up to form a bag, besides several paper records in the Early Sogdian language.

The same fierce east-northeast wind prevailing during the greatest part of the year which has sculptured the soil of the Lou-lan tract into *yardangs*, since it lost its water and with it the protecting cover of vegetation some sixteen hundred years ago, had sufficed to grind down and carry off almost completely the eastern and western faces of the circumvallation of the ancient Lou-lan station which stood across its course and against which it acted with full force. The northern and southern walls owed their partial survival to the fact that they stretched in the direction of the prevailing wind and thus offered far less scope for its erosive action. The whole circumvallation formed a square of approximately a quarter mile on each side, and observation with the prismatic compass proved that the ancient Chinese engineers had been careful to adapt its orientation exactly to the prevailing direction of the wind, thus assuring the maximum of shelter for the occupants as long as the walls would hold out against that incessant assault.

Excavating Near Lou-lan

On the bitterly cold morning of February 14 with the temperature at —12° F. I took the laborers out to the nearest of the ruins toward the west, which had been discovered by Lal Singh in his reconnaissance survey of the dead channels of the dry river. After some interesting geographical observations on the temporary return of moisture after a prolonged period of drought and after further collections of ancient stationery in wood, curious household implements, and a decorated bronze mirror, I set out for the more distant ruins to the northeast. In time we came to some small bronze fragments and potsherds, indicating that the ground had once been occupied. At length we came to an ancient burial site with large grave pits marked by rough tamarisk posts.

We found here an abundance of household implements of all sorts, objects of personal use such as artistically decorated bronze mirrors, wooden models of weapons, Chinese records on paper and wood, and, above all, a wonderful variety of fabrics of all hues which delighted my eyes. Among them were beautifully colored silks, pieces of rich brocade and embroidery, fragments of fine pile carpets, by the side of coarse fabrics in wool and felt. It soon became clear that these remnants of garments of

all sorts had been used for wrapping up bodies, perhaps partially embalmed; and the experience gained by me a year later in the exploration of cemeteries of the Tang period at Turfan has fully confirmed this conclusion. I could not have hoped for a more representative exhibition of that ancient silk trade which we know to have been a chief factor in opening up this earliest route for China's direct intercourse with Central Asia and the distant West.

I soon realized from various indications that the contents of these pits must have been collected, before the final abandonment of the Chinese

FIG. 10—Camels marching between salt-encrusted ridges near northeastern shore of ancient dried-up Lop-nor.

station of Lou-lan, from older graves which wind erosion or some similar risk was threatening. Consequently all the relics here saved from destruction, in obedience to a pious custom still prevalent among the Chinese, could safely be assigned to that period of the Han dynasty which followed the first expansion of Chinese trade and political influence into Central Asia about the close of the second century before Christ. In any case none of the remains could be later than the third century of our era.

EXPLORATION OF AN ANCIENT FORTIFIED STATION

We next sought the large walled enclosure of which Afrazgul had told me and whose dark-outlined ramparts had helped to guide us from afar. It was a long weary tramp. But all fatigue was forgotten over the delight of the interesting discovery made upon arriving. The walls of the ancient

station, forming a square of about 450 feet and remarkably well preserved in spite of twenty centuries of exposure, were built with regular layers of stamped clay and carefully secured reed fascines. Their constructive features showed closest agreement with those I remembered so well from the fascinating remains of that westernmost extension of the ancient Chinese border wall, or *limes*, which I first traced and explored in 1907 in the desert of Tun-huang. A rapid inspection soon convinced me that we had struck the fortified *castrum* which had served as a *point d'appui* for Chinese missions and troops where they first reached Lou-lan territory, after

FIG. 11—Camels with baggage and ice loads crossing salt-encrusted bed of ancient Lop-nor. (Hassan Akhun on extreme right.)

having crossed the salt-encrusted dry bed of the ancient Lop Lake and skirted its absolutely barren northern shores. A variety of antiquarian observations makes it certain that this fortified station dated, like the Tun-huang *limes* itself, from the first military advance of the Chinese into the Tarim Basin, about 104 B. C., and that it represented the bridgehead, as it were, of the desert route by which that advance was made possible.

The walls, from 12 to 18 feet thick at their base and in most places still standing over 10 feet in height, had nowhere been seriously breached, while the open ground outside had been scooped out and lowered to as much as 20 feet below the original level, as marked by the foot of the ramparts. In the interior, some of the beams scattered in utter confusion were fully a foot across and still over 25 feet in length.

Ascending the rampart at daybreak next morning a striking view opened out before me as the sun rose. To the north and northeast in the distance showed strings of reddish-brown *meshas*, bold clay terraces of great height rising in island-like isolation along what looked like the shore of a salt-encrusted dry sea. The ground separating us from the nearest among them seemed to have been worn down by the wind with fair uniformity, and what *yardangs* there were looked low. To the west and southwest a dismal maze of erosion ridges and trenches met the eye. But eastwards the view ranged unbroken over a vast grayish-white plain of salt, unending in its flatness like the ocean in a calm. It was the flat bed of the ancient dried-up Lop Lake and of the fresh-water lagoons and marshes which must once have fringed it on this side during early historical times.

An Ancient Lookout Post

The *mesha* nearest to the northeast was the one which by its bold castle-like outlines had attracted Afrazgul's attention on his reconnaissance march from the south and on which he had traced remains of human occupation. A three miles' tramp across low *yardangs* and salt-encrusted patches brought us to it. With steeply eroded slopes the long and narrow clay ridge rose before us to a height of over a hundred feet (Fig. 7). The strata of clay composing it showed almost vertical faces along the longer sides and at its sharp northeastern point, thus rendering access possible only from the southwestern end, where the *mesha* tapered away in easy steps.

The northeastern end of the ridge, which was its highest portion and about 30 yards wide on the top, had been separated from the rest and turned into a small fort by a massive wall of clay blocks built across on the southwest. A deep trench cut into the hard clay, about 6 feet wide, ran in front of the wall and helped to protect the only accessible side of the stronghold. The gateway leading into it still showed its timber framework, and in one of the rooms which had been built against the protecting wall the big roughly cut beams of wild poplar wood which once supported the roof remained *in situ*. A small heap of oat straw we found here was of importance as proving that cultivation of some sort must have extended even to this vicinity. Refuse of reed straw and horse and cow dung thickly covered the floor in two other rooms, and from here we recovered a variety of interesting small finds. Besides remains of rough household implements in wood, such as a fire block, as well as a thin ring in gold, these included some records on wood and paper, both in Chinese and in that early Indian language written in Kharoshthi which my previous discoveries prove to have been in official use even in this distant part of the Tarim Basin during the first centuries of our era.

A Mummy 1600 Years Old

Everything indicated that the fortified top of the *mesha* had served as a stronghold and lookout post for some petty chief of the indigenous population of Lou-lan. Of the physical type and simple semi-nomadic ways of the Lou-lan people, as the Chinese found them on the first opening of the route through the desert, the Han annals have preserved some curious notes. The accuracy of these was illustrated in a most striking fashion by the examination of the graves which we found covering the central portion of the ridge. The very first grave we opened furnished vivid glimpses of a phase of human existence which seemed to have vanished as completely as had living nature itself for long centuries from this land of the dead. But they were striking enough to stir the stolid Loplik diggers into a state of undisguised trepidation. Under five pieces of excellently preserved cowhide lay the coffin as sound as when first made. It was formed by two solid halves of a *toghrak* trunk, hollowed out to serve as sides, with two smaller pieces for headboard and footboard. Above and resting on the side trunks were placed seven closely fitting top boards. When these were carefully removed one after the other by Sadik, a young Loplik whom the hope of "treasure" and the promise of a special reward had induced to pluck up courage for this and similar tasks, we saw before us the body of a young man, absolutely intact as it had been buried certainly not less than sixteen hundred years ago.

The face and the headdress were exposed, as well as the feet cased in short boots of red leather. A large cloak made of a coarse but well-woven brown woolen fabric enveloped the rest of the body. On the head was a conical felt cap decorated with narrow circular bands of red braid and an aigrette of feathers. Attached to the top of the cap were tassels made up of some small animals' tails. Small jug-shaped baskets excellently woven with patterns in different-colored straw held remains of foodstuffs which still await close examination, like the rest of the relics brought away from this and other sites. Tied up near one edge of the cloak was a small packet of crushed leaves, no doubt intended, like the contents of the baskets, to provide the dead with creature comforts in another existence. Pins of hard wood fastened the garment in front, and when this was loosened and thrown back we found the body quite bare but for a loin cloth made up of a close-set row of thick tassels in brown wool. Feathered arrow shafts lay by the side of the body. The features were distinctly non-Mongolian, recalling that *Homo alpinus* type, widespread in Europe, which still supplies the prevalent element in the racial constitution of the indigenous population of Chinese Turkestan and which in Asia is seen in its purest form among the Iranian-speaking hillmen near the Pamirs.

It was a strange sensation to look upon this and other figures which still retained the semblance of life and to feel oneself brought face to face with people who inhabited, and no doubt liked, this dreary Lop-nor region in the

first centuries of our era. Everything about them indicated a race of semi-nomadic hunters and herdsmen, as the Chinese annals describe the people of Lou-lan. In spite of the trade route which Chinese enterprise opened through the areas of riverine jungle and marshland serving them for their chase, their fishing, and their pasture, they had evidently clung to their time-honored ways and retained their distinct if primitive civilization.

The general appearance of those old Lou-lan men whom our *ketmans* had for a brief span of time brought again to the light of the sun seemed curiously to accord with the significant juxtaposition in which small bronze objects of Chinese origin were picked up on the slope below the little fort together with stone implements of various sorts, including a jade celt. Elsewhere, too, I came upon indications suggesting that the interval separating the latest Neolithic period in Lou-lan from the first advent of the Chinese may not have been a long one.

Our survey proved that the Lou-lan site, the fortified station, and the stronghold on the *mesha*, all lay along a straight line leading due northeast. It seemed a clear indication that the ancient Chinese trade route I was anxious to trace onwards followed the same direction.

Start for the Northern Edge of the Lop Desert

On the morning of February 17 we started on our return to the Lou-lan base camp, still pursued by the violent *buran*, or sandstorm, which had overtaken us in the fortified station, to which we had returned the previous afternoon upon the completion of our work on the *mesha*. Fortunately the storm abated by midday, and we were able to reach the Lou-lan base by nightfall. Here I found Lal Singh safely arrived after accomplishing all his survey tasks in the west and along the "Dry River" beds on a circuit of some 400 miles.

After paying off my Loplik laborers and sending them back to the world of the living, we started out the next morning to carry out the remainder of the journey we had proposed for ourselves in the Lop region. With our united and yet much reduced caravan Lal Singh and myself first moved to the Kuruk-tagh, in order to secure for our hard-tried camels a few days' real rest with water and grazing at the salt springs of Altmish-bulak. The route we followed for a day and a half to the northwest took us across an endless succession of *yardangs*, broken only here and there by dry branches of the ancient river bed. On this utterly desolate ground we again met traces of occupation in early historical times. Where we struck the foot of the bare gravel glacis stretching down from the disintegrated red hill chain of the outermost Kuruk-tagh, I was able to examine two small burial grounds which Lal Singh had first discovered. They unmistakably belonged to the period when the riverine belt below, now dried up and eroded, had been followed by the ancient Chinese trade route.

Thence we turned to the east and, guided by Abdur Rahim, who knew

the ground here from his expeditions after wild camels, skirted the foot of the Kuruk-tagh. Tramping across absolutely bare slopes of detritus and low rocky ridges showing an extreme state of disintegration, it needed imagination to feel that one was near "mountains." And yet after many days spent over drift sand, wind-eroded clay, and *shōr* the hard going seemed a welcome change to the feet. But even more welcome was it when at last by the evening of February 20 we arrived at the tiny oasis of Altmish-bulak. There was little to please the eye in the small area of dusty tamarisk scrub and salty reed beds, scarcely more than half a mile across anywhere, nestling on the western side of a vast barren basin worn

FIG. 12—Wind-eroded clay terraces (*meshas*), 80-100 feet high, near foot of gravel glacis of Kuruk-tagh.

out by dry flood beds. Yet, after the dead world we had toiled in, this little patch of vegetation seemed truly delightful to us humans, and I rejoiced at what it meant for our brave camels. The least brackish of its half-a-dozen small springs gave them their first real drink for three weeks, and from the reed beds around they could gather fresh strength for the hard task which still lay before them.

DEPARTURE ON JOURNEY TO TRACE ANCIENT CHINESE TRADE ROUTE

After four days of rest we left the little oasis on the morning of February 25 in two columns for our respective tasks. The one allotted to Lal Singh was to survey the unknown northeastern shores of the great salt-encrusted basin which represents the fullest extension of the dried-up ancient Lop-nor, and the barren hill ranges of the Kuruk-tagh overlooking them. The well of Kum-kuduk was fixed as the place where he was to rejoin or await me. I myself, accompanied by Afrazgul and Shams Din,

proposed to search for the ancient Chinese trade route where it left the edge of the once inhabited Lou-lan area and to trace it over whatever ground it might have crossed, right through to where it was likely to have diverged from the line followed by the modern caravan track which leads from Tun-huang along the southern shore of the great dried-up Lop Lake towards Miram.

The task was after my own heart, combining geographical and historical interest, and of singular fascination. But I could not disguise from myself the serious difficulties and risks which were bound to attend it. From what I knew of the general character of the ground before us it was certain that we could not hope for water, nor over most of it for fuel to melt our ice with, before striking the Tun-huang caravan track, a matter of some ten days' hard marching, judging from the distance indicated by our previous surveys. There was a limit to the endurance of our brave camels; for with the heavy loads of ice, fuel, provisions, and Chinese silver which had to be carried for safety's sake, I could not expect the animals, already hard tried by the preceding work in absolute desert, to remain fit for more than ten or twelve days.

Physical difficulties soon presented themselves after we had descended for some 10 miles from Altmish-bulak southeastward to the edge of the bare gravel glacis. Beyond it we struck line after line of wall-like clay terraces, up to 60 feet in height and more, all eroded by the same east-northeast wind which had sculptured the usual *yardangs* of the Lou-lan area, but obviously of far greater age. It was difficult to thread a way practicable for the camels through or across them without prolonged search or détours. Even more trying for the camels was the ground to be crossed between these long rows of *meshas*. Here we encountered a succession of ridges, far less elevated and of soft outlines, but coated with a hard crust of salt-impregnated clay which caused pain and soon lesions, too, to the feet of the camels. It was a surface formation that was new to me but by no means welcome as a foretaste of what we might find farther on. It seemed quite a relief when these horrible salt-encrusted hummocks gave way at last to mere *yardangs* of the usual type. In the red light of the evening the rows of high *meshas* we continued to encounter assumed a fantastic appearance, like bastioned walls of some huge circumvallation. We had not covered more than 17 miles when the manifest fatigue of the camels obliged us to halt by nightfall. For the first time the dead wood to be picked up around for fuel was extremely scanty and had to be supplemented from the store we carried, limited as that was.

Next morning I got the men to rise at 4 o'clock, which assured a start with the laden camels soon after daybreak. As we crossed what proved the last of the strings of *meshas* and ascended the highest for a lookout, the sharp eyes of Afrazgul sighted far away to the south the big isolated ridge which bore the remains of the indigenous stronghold and cemetery we had

explored on February 17. My intention had been to strike the *mesha* to the northeast of it, where Afrazgul on his reconnaissance of the same day had found surface traces of human occupation, and to make this the starting point for the search of the line which the ancient route had once followed onwards. Soon this point, too, was picked up, and, though the ground with its hard salt-impregnated clay lumps continued to try the camels' feet badly, it was reached by noon. Here, to my disgust at the time, camp had to be pitched for the day. One of our camels had broken down a mile or two before and refused to move on though its load had been distributed among others.

The examination of the remains on the *mesha* below which we had halted did not detain me long. They proved to be those of an outlying indigenous camping place. Reed bundles mixed with cow dung, pieces of simple matting, burnt pieces of wood in a small hollow once used for a fireplace, rags of a sheepskin coat, and the like were all that wind erosion had allowed to survive on the top and slopes of the *mesha*. A Neolithic arrowhead and a few similar relics were subsequently picked up below. More significant than these modest remains was the fact that the ridge which had served for this camping place lay, as the plane-table showed, exactly in the line that led from the Lou-lan site through the ruined *point d'appui* and the indigenous petty chief's stronghold northeastward. The fact agreed well with my previous conjecture that the initial bearing of the ancient route we were endeavoring to trace lay to the northeast. But there was obvious need for more definite confirmation; and so I was eager to use the time left by our halt for a careful reconnaissance of the ground ahead.

Identification of Route by Ancient Watchtower

Sending Afrazgul to examine a group of *meshas* which showed north-northeast, I myself set out with Tokhta Akhun for an isolated high clay ridge sighted to N. 60° E. As I approached it, after a three miles' tramp over ground where the last traces of ancient vegetation gradually died away, I noticed on the highest portion of the ridge something dark which looked like the remnant of a wall foundation. But I scarcely ventured to believe my eyes until I had eagerly clambered up the steep *mesha* from the southwest, the only accessible side, and beheld before me layers of carefully fastened tamarisk fascines stretching for over 20 feet along the narrow top of the ridge. Far-advanced erosion had pared the long sides of the ridge so much that the substructure of fascines was reduced to only 7 or 8 feet in width. Yet enough remained to convince me that the methods of construction and the original dimensions were exactly the same as in many of the ruined watchtowers I had examined along the ancient Chinese *limes* in the desert of Tun-huang.

Familiar as I had become with those ruins of Han times I could not

feel any doubt about the character and origin of the structure, however badly eroded, which had once crowned the ridge. It must have been a watchtower built by the Chinese, like the previously discovered terminal *castrum*, probably over two thousand years ago when the route to Lou-lan was first opened and the *limes* itself carried forward towards the Lop Desert. Perched on the high *mesha* that marked the extreme eastern edge of the once habitable area, this lonely tower must have served as a landmark for the traffic that passed by during centuries. A small heap of refuse which had survived in a sheltered hollow just below the foundation contained burnt chips of tamarisk and *toghrak* wood and was definite indication of the tower's having been occupied by watchmen.

Difficulties of Traveling for Camels

This discovery gave the desired confirmation as to the direction of our onward move, and my elation was great. Afrazgul was able to share it when he came to join me, having on his own side found nothing but a single badly eroded grave on a *mesha*, with a skeleton. On my return to camp I found that Hassan Akhun, my camel factotum, had safely brought in the ailing camel after "re-soling" two of its feet, the pads of which had become lacerated by the first day's terrible going over the fissured hard crust of salt.

Other camels' feet also had suffered and become sore. So Hassan Akhun and the other camel-men were busy till nightfall over re-soling them. It was a painful process for the poor beasts, however beneficial in its results, this sewing on of small pieces of thick oxhide to the live skin so as to protect the sore places. Then came in the evening the almost equally troublesome business of giving the camels their draft of rapeseed oil, which Hassan considered it requisite to administer now every second night in order to keep up their stamina. He called it "the camel's tea," and I knew well from previous desert journeys what excellent effect this provision of oil had on camels when subjected to prolonged deprivation of grazing and water. But it was not easy to make the poor beasts swallow it. Only by holding up their heads firmly in spite of violent struggles and by pouring the half pint or so of rancid oil in repeated small doses down their noses could success be assured; and, as the operation was a long one with the more self-willed beasts, Hassan Akhun and his myrmidons were kept hard at work most of the night.

Definition of Route by Finds of Coins and Arrowheads

Next morning we started at the break of dawn into the desert northeastwards. Buoyed up as I was by the discovery of the watchtower, I could not disguise from myself the perplexities which were likely to meet us ahead. I knew that we had now reached the extreme eastern limit of the

area to which the waters of the Kuruk-darya had once carried life. Beyond this there would be no chance of ruins to guide us. The desert eastwards was even in ancient times as devoid of plant and animal life of any sort as it is now. As we left behind the withered and bleached fragments of the last dead tamarisk trunk lying on the salt soil, I felt that we had passed from the land of the dead into ground that never knew life—except on the route to be tracked. The contrast was so impressive that we felt almost regret at taking leave of the former. I little foresaw at the time

FIG. 13—Sir Aurel Stein's party at Miran. (Sir Aurel Stein in middle. On left R. B. Lal Singh and Ibrahim Beg, on right surveyor Afrazgul Khan, seated: Jasvant Singh, Rajput follower, and Muza Akhun, Yarkand caravan man, behind.)

that, as we steered onwards by the compass across absolutely barren wastes of clayey *shōr*, hard crumpled salt or detritus, chance would help us in a way which at times might well seem uncanny.

The first thrilling incident occurred that very morning. We had passed the ridge bearing the remnants of the ancient watchtower, and the last traces of dead desert vegetation were far behind us, when suddenly we found the ancient track plainly marked for about 30 yards by over two hundred Chinese copper coins strewing the ground of salt-encrusted clay among quite low *yardangs*. They lay along a well-defined line running northeast to southwest and about three or four feet across, just as if some kindly spirit among those old Chinese wayfarers who had faced this awful route with its hardships and perils wished to assure us that the bearing we were steering by was the right one. In reality the coins must have

got loose from the string which tied them, and gradually dropped out unobserved through a small opening in their bag or case. They were all of the type common under the Early Han dynasty and seemed fresh from the mint, with rims and legends clear and sharp. Only 8 pieces out of 211 picked up were broken.

Some fifty yards farther on in the same direction we came upon a similar scattered heap of bronze arrowheads, all manifestly unused and looking as if newly issued from an arsenal of Han times. The way in which several were found sticking closely together proved that they, too, had been packed tightly in a bag or case. Their shape and weight exactly agreed with the ancient Han ammunition that I had often picked up along the *limes* of Tun-huang, which was garrisoned during the first century before and after Christ and which is frequently mentioned in the Chinese military records I had recovered from its ruined watchtowers. The way in which the coins and arrowheads remained on the ground suggests that they had dropped from some convoy of stores which was moving at nighttime, probably a little off the main track but still in the right direction. They may well have got lost sight of on the sand then covering the salt-encrusted ground—some sand still remained now between the *yardangs*—until progressive deflation caused them to sink to the *shōr* crust below from which I picked them up so many centuries later.

Other Evidences of the Route

Next day's long march started auspiciously with the reassuring find of a Han coin, picked up within half a mile of our camp, and about six miles farther on brought a discovery that was both stirring and useful. We had followed our northeasterly course across easy ground of bare clay and mica detritus when it approached at a slant a forbidding belt of salt-coated erosion terraces. These clearly represented the type to which the Chinese of Han times applied the graphic designation of "white dragon mounds" as mentioned in an early account of the ancient desert route to Lou-lan. It was an exciting moment when my eyes fell upon a well-preserved dagger of steel, ten inches long and fitted with a crossbar, lying apart on the slope. In this forbidding desolation it was a dramatic surprise to receive such striking confirmation of our still being on the ancient route. As I examined these relics which travelers separated from us by so many centuries had left behind, all sense of time seemed effaced.

But there was more than a mere romantic interest in the find. It was clear that the terrace had served as a regular halting place, because at its foot was the first piece of ground, level and fairly clear of salt, which travelers would strike after passing through the forbidding maze of "white dragon mounds" and the dried-up lake bed beyond. I had to decide whether I was to strike across the latter or to skirt the ancient lake shore by steering a more northerly course, which threatened to take us farther

away from where we hoped to find water. As I suspected and as Lal Singh's survey subsequently proved, it would have meant a détour of days, and the interpretation I put on our lucky find encouraged me to avoid this by heading east for the dead salt lake.

Soon the ground grew difficult, being covered with crumpled-up cakes of hard salt; and when we actually reached the belt of the salt-encrusted "white dragon mounds" progress with the camels was possible only by keeping to the line of these dismal hillocks. Fortunately the salt crust of the depressions between them grew softer after a few miles, and finally a tongue of flat ground with a clay surface but slightly salt-encrusted allowed us to resume the bearing due east and to complete a long and tiring day's march in comparative comfort. At last a line of salt-coated terraces was sighted in front, and this time we greeted the "white dragon mounds" gratefully as marking our approach to "land;" but it took long hours to reach them.

The Margin of the Ancient Lake Bed

When we reached the first patch of soft brownish salt overlying coarse sandy soil just in front of the salt-covered ridges, indicating as it were the opposite seashore, and we could halt for a night's rest, I had good reason to feel glad for my choice of route and grateful for the lucky find which had prompted it. The following marches, as well as Lal Singh's experience on his route farther north, proved that we had crossed the forbidding sea of hard crumpled salt on the very line where it was narrowest, thus escaping a couple of nights' halt on ground where neither beast nor man could have found a spot to lie down in comfort. It was, no doubt, this advantage which had determined the old Chinese pioneers with their keen eye for all topographical features in the choice of this line for their route.

All the same our night's rest was far from cheerful. A bitter northeast wind cut through the warmest furs and wraps. The camels showed signs of feeling sadly the pinch of hunger.

Fortunately the worst of the desert crossing now lay behind us. The ends of a series of low barren hill ranges were sighted to the east. Far away to the southeast I thought I could recognize through my glasses a bold hill crest which I remembered from our survey of 1907 as overlooking the easternmost portion of the ancient Lop lake bed where the track from Miran towards Tun-huang skirts it. Steering in this direction we wound our way for miles through strings of salt-coated terraces, all running northeast to southwest with depressions of hard salt crust between. Trying as the going was it seemed easy after the previous day's experience, and gradually the parallel ridges grew farther apart, with the bare clay between now exposed and undergoing erosion. At last after about ten miles they disappeared altogether, and an open plain of decomposed clay and mica lay before us, stretching down glacis-like from the hill foot eastwards.

Absolutely barren as the ground was it seemed quite a treat for our eyes. The camels, too, felt the comforting change and stepped out as they had not done for days. We had marched on gaily for a few miles when finds of copper coins of the Han type and of glass beads cropped up in rapid succession. It was most encouraging to receive fresh assurance that the line we were following was that of the ancient route.

Our march of March 3 took us steadily south-southeast in the direction of the previously noticed bold group of peaks with which the western end of the southernmost hill chain of the Kuruk-tagh juts out into the basin of the ancient Lop Lake. The salt-encrusted flat surface of the latter was seen on our right stretching away unbroken to the horizon. In order to avoid any of its inlets, which might have caused fresh trouble to our poor camels, we kept well up on the stony glacis formed by decomposed low ridges along the foot of the hills. It was by no means smooth going, but what a comfort it seemed to tread again real stones! The ancient route must have skirted the dried-up salt sea more closely; for we came upon no relics of ancient traffic that day. In the evening we descended to fairly level ground by the old shore line. The ground crossed all day was still absolutely barren, without a trace of even dead vegetation. Yet close to where we camped, after a twenty-one mile tramp, we noticed a wild camel's track among the low ridges of detritus.

The Eastward Arm of Lop Nor

After a night most of which was spent in administering oil to the camels I had to rouse the men by 3:30 next morning. The animals were beginning to show plainly how much they suffered from hunger, and even with loads greatly diminished it became obvious that a timely arrival at grazing and water had to be effected by long marches. Continuing due south for some miles we came into full view of the dead salt lake where it extends a wide arm eastward along the foot of the hill range the end of which we had steered for. We now turned southeast and were after a couple of miles suddenly brought up by precipitous clay cliffs rising some 120 feet above the edge of the ancient lake shore, here stretching from west to east. It was a striking view which here opened out before us. The ancient petrified sea, with its brownish salt crust upheaved into countless small billows, stretched away on the south and southwest unbroken to the horizon, without any thing to distract attention from its impressive uniformity and grim grandeur. There were no strings of "white dragon mounds" hugging the shore line nor any *meshas* looming in the distance.

I knew that this big arm of the ancient Lop Lake grew narrower eastwards; and as the position of Kum-kuduk, computed from our previous surveys, was still far away to the southeast, it was better to keep east along the shore line we had struck and thus reduce the distance to be covered across the trying bed of hard salt. A narrow strip of gravel-covered fore-

shore at the foot of the cliffs, to which we managed to bring down the camels, fortunately offered an easy line of progress. As we skirted this shore line under steep cliffs, projecting in places into eroded bold bluffs and looking exactly like those of a sea still in being, I had the satisfaction of finding clear evidence of the ancient traffic that once moved along here in the shape of small ornaments in stone and bronze which were picked up in succession.

Discovery of a Still Preserved Stretch of the Ancient Road

We had marched some fifteen miles from camp when almost simultaneously Tokhta Akhun's attention and my own were attracted by a narrow but unmistakable old track impressed in the gravel by the side of a wild camel's recent footprints. It was very puzzling at first and almost uncanny, since Tokhta Akhun's experience knew of wild camels following the same regular track only where it leads to water or grazing, and of these there was certainly none now behind us. Had wild camels trodden down this path at a period when some vegetation still grew along the shore line farther west? Or could they possibly have taken to following here a track, first made by man but long since abandoned by him, for the sake of easier approach across the dead salt sea to grazing along the Kuruk-darya before it completely dried up?

But soon my eyes were to meet a sight far more decisive in its evidence. We had followed the wild camel's track for about a mile and then lost it where the shore line curved inwards to the north, leaving a wide bay covered with a hard crust of salt. Wishing if possible to save the camels a big détour, I moved straight ahead to a hillock rising from the western side of the bay about twenty feet, in the hope of finding the surface easier beyond. In this I was disappointed. But, when I had ascended the salt-coated hillock and looked around, my eye was caught at once by an absolutely straight line running right across from the western end of the bay to the headland which I had sighted before as its eastern end. It was the long-sought-for ancient road, preserved here in all the clearness which the salt-encrusted ground could assure. It was a stirring sensation as I looked down on its broad straight line and then, after determining its direction by plane-table, marched along it for nearly two miles. Close examination showed that the road had a uniform width of 20 or 21 feet and was worn down to a depth of about one foot in the surface of hard salt cakes, as a result of the passage during centuries of transport animals and probably carts too. Its surface, owing to a soft crust covering most of the underlying hard cakes of salt, offered far easier going than the ground adjoining on either side. There was ocular evidence here of the magnitude of the traffic which had once moved through these forbidding solitudes. But how those patient old Chinese organizers of transport had maintained it over some 150 miles without water, grazing, or fuel still remained somewhat of a problem.

Beyond the bay the narrow old track reappeared on the foreshore, which now widened and became sandy in places. For about half a mile it ran close along a raised bank some 20 feet wide at its top, a fact which at the time puzzled me greatly. Subsequent observations elsewhere have led me to conjecture that it may mark the alignment of an ancient canal by which the engineers of Han times seem to have endeavored to carry water from the terminal basin of the Su-lo River as far as possible westwards.

End of the Desert Journey

We started late next morning to let the camels enjoy what scanty grazing there was. But as we moved on by the line of shore cliffs eastward the patches of reeds grew wider, tamarisks dead and living appeared on their familiar sand cones, and finally we came upon hardy scrub and thorns thriving in what to our desert-trained eyes almost seemed luxuriance. We halted after a short march, all of us feeling the need of a rest and glad to let the camels enjoy a good feed at leisure. The concession made to men and animals brought antiquarian reward, too, for me; for Tokhta Akhun, when searching in the evening the high bare cliffs of clay above camp, discovered in a small cavelike shelter a quantity of ancient potsherds and an iron buckle dating back, by the evidence of its ornamentation, to the period of the Lou-lan ruins. So to the last relics of the ancient traffic kept by us.

On the morning of March 6 we were off by daybreak, as I hoped by one long march to cross the arm of the dead lake and strike the well of Kum-kuduk on the caravan track towards Tun-huang, fixed upon as our rendezvous. From the top of a high clay terrace some two miles beyond our camp I sighted far away to the south-southeast a line of tower-like *meshas* which, raised by refraction above the true horizon, quivered phantom-like in the white haze. Their bearing coincided exactly with the position which my survey of 1907 showed for the group of big *meshas* I remembered to have passed on my approach to Kum-kuduk by the route from Miran. So towards them we steered straight across the wide expanse. The ground was trying enough, and in places patches of actual salt marsh were now met with which threatened to embog our camels and necessitated great détours (Fig. 10). But even the camels seemed to feel encouragement from the nearness of the goal, and at last after fifteen miles' struggle we struck sandy ground near the northernmost of the *meshas*. A little beyond I could lead the men to their great joy on to the lonely track where footprints of camels, ponies, and donkeys assured them that they had truly reached the "big road" from Miran to Tun-huang. Their Odyssey in the unknown wastes was ended.

COTTON GROWING IN SOUTH AMERICA

By GEORGE McCUTCHEON McBRIDE

As the most largely used textile, the greatest staple of international trade, cotton has a prime geographical interest from the mere magnitude of its place in human affairs.[1] The peculiar features of its distribution add greatly to that interest. The cotton plant is of very ancient cultivation, but only during the last century has it attained its great relative importance. Although cotton in its natural state is widely distributed, commercial cotton is produced in restricted areas. Of the world's production three-fifths comes from the United States, nine-tenths of the remainder from China, India, Egypt, and Russia (Turkestan and Transcaucasia). But only the United States, India, and Egypt produce for export. The supply for the world's market is thus virtually an Anglo-American monopoly.

Concerning the distribution of cotton as a commercial crop two questions arise. How can the area devoted to cotton be increased to keep pace with the ever-increasing demand for cotton? How can the distribution be extended that the dangers of dependence on so restricted sources of supply may be avoided? Since the American Civil War the industrial countries of Europe have been concerned with these questions, more especially in recent years, as the activities of the British Cotton Growing Association (founded in 1902) and the similar organizations of France (1903) and Germany (1900) bear witness.[2]

Cotton, in the wild state, is a plant of the tropics and subtropics—of the warm regions with summer rains and a succeeding dry season. Under cultivation the range is extended, in particular under irrigation. At present cultivation is largely limited to the regions near the northerly climatic limit in North America and Asia. In the search for new fields Africa and South America, presenting the bulk of the land surface within the tropics and subtropics, naturally invite attention. Both continents offer hopes for the future extension of the cultivation. In Africa interest concentrates on the Sudan. The various railroad schemes for tapping the heretofore inaccessible resources of this naturally productive region point to extensive possibilities of cotton growing. The irrigable lands of the Niger bend, for instance, are compared with Egypt. Such expansion will be chiefly to the profit of France and Britain. In contrast South America offers possibilities in countries politically independent, a circumstance that has already awakened wide interest. Efforts to increase production here are

[1] See the article "Cotton and Human Affairs" by Mr. McBride in the March, 1920, number of the *Journal of Geography*.—EDIT. NOTE.

[2] Alfred Renouard: L'évolution cotonnière américane et ses consèquences pour l'Europe, *La Nature*, No. 2372, 1919, Sept. 13, pp. 170-174.

FIG. 1. (For sources, see bottom of opposite page.)

being made in earnest, and it seems opportune to present a study of the situation as it now appears.

Cotton is grown in every South American country, yet only two—Brazil and Peru—produce it on a commercial scale; and their output is almost negligible in the world's total. In 1915 Brazil produced 1.3 per cent of the world's supply of commercial cotton, Peru little more than one-third of this amount. Obviously this is not the limit of possibilities, which we now proceed to examine in detail.

Cotton in Peru: A Desert Crop

A particular geographical interest is attached to cotton production in Peru. Long before the arrival of the Spaniards, cotton was an important cultivation. It had given rise, in fact, to the highest expression of indigenous culture, the textile art, in which, as numerous specimens show, the ancient Peruvians excelled. Today this art has been lost; but cotton cultivation, long fallen into serious neglect, has lately had a notable revival.

In Peru, as in Egypt, cotton is a desert crop. The Andean highlands are too cold, the eastern slopes of the mountains in general too humid for the plant to thrive.[3] But in the third physiographic region of the country, that of the arid coastal belt, it finds its suitable sunny habitat.

To the traveler along the Pacific steamer routes the west coast appears an unbroken, brown desert, impossible of cultivation. On landing at some desolate little port whose corrugated iron structures seem but the temporary shelter of nomadic prospectors or engineers, it is with great surprise that he finds the wharves piled high with bales of cotton or bags of sugar and rice. The town itself is barren. The hills at the back are treeless. Water is peddled in the streets and sold by the pailful. A narrow-gage railway running up along a valley seems to lead only deeper into the desert. Following such a railway line for a few leagues from any port one comes into a flat-bottomed gorge where fields are green with growing crops. Clustered huts of workmen, hamlets of small tradesmen, even little cities, lie hidden in these oases, seldom, however, encroaching upon the irrigable soil of the valley floor but strung out along the sharply defined edge of the desert at the foot of the bordering slopes.

Irrigation is made possible here by the streams that flow from the Andes for at least a part of the year. Many of these streams never reach the sea. Other rivers—even intermittent brooks are indiscriminately styled

[3] Cotton is grown on the sheltered floors of some of the valleys of the *montaña*, but as regards commercial production they are impossibly remote.

SOURCES FOR THE MAP, FIG. 1—For Brazil, the state products maps published by the Secção de Geographia Agricola of the Sociedade Nacional de Agricultura, 1908; for Argentina, Estadistica Agricola, 1916-1917, Minist. de Agric., Buenos Aires, 1918, p. 22; Agricultural and Pastoral Census of Argentina in 1908, Buenos Aires, 1909, Vol. 2, pp. 435-436, Vol. 3, pp. 400-402; The Argentine Year Book, 1915-1916, Buenos Aires, pp. 232-234; for Peru, the references cited in footnotes 4 and 6; for the other countries, scattered information.

ríos in this parched land—empty into the ocean during a few months of the year. Very few are perennial. Irrigation can be carried on along narrow strips that border the channels, but only at certain seasons, though the soil is a deep alluvium and yields well where water is available. The near-by deposits of guano supply a cheap and abundant fertilizer. It is in such spots that the important cotton-producing areas of Peru are located.[4]

Varieties Grown

The native plant grown before the Spanish conquest is still widely cultivated. The fiber of this native species, of which two main subvarieties are cultivated, is rough and long and is highly prized for mixing with wool or for use in imitation woolen fabrics. Native Peruvian cotton is not planted anew each season but lives for several seasons, even attaining a life of twenty years. In the warmer valleys, where the plants reach the greatest age, stalks sometimes grow to be from 10 to 15 feet high. The best fiber comes from plants not more than four or five years old. Another native variety grows wild in some parts of the country but is not cultivated. Foreign cotton has also been introduced and forms more than 50 per cent of the present production. The so-called "Egyptian" cotton from the United States is the most popular. It grows more rapidly but does not live so long and cannot stand drought so well, hence it is cultivated chiefly in the valleys best supplied with water. The price it commands is not so high as that of the native fiber and is subject to greater fluctuations, but its yield per acre is considerably greater than that of the Peruvian plant.

Distribution

Eighteen of the Peruvian coast valleys produce cotton for export, but the following seven stand out above the others: Piura and Chira in the north; Chancay and Cañete in the department of Lima; Ica, Chincha, and Pisco in the department of Ica in the south. The principal factor that controls the time of planting, and consequently of picking, is neither the seasonal variation of temperature, which, in fact, is very slight, nor local rainfall—as we have remarked, entirely lacking in most of these valleys—but the arrival of water in the dry stream beds.

In the far north of Peru, in the valley of Piura, equatorial rains occasionally cross the sharply defined northern border of the desert. The inhabitants expect a wet season about every seven years. The rain then falls continuously for several days at a time. These years are the "good years," *años buenos*, for cotton then may be grown on land long unused. Plants put in the ground at that time yield several crops without further rain and without irrigation.[5] The exports at Paita, the chief port of this

[4] A detailed description of how the textile is grown may be found in the official Peruvian publication, *Boletín del Ministerio de Fomento*, Vol. 14, No. 1, pp. 25-94.

[5] A. F. Sears: The Coast Desert of Peru, *Bull. Amer. Geogr. Soc.*, Vol. 27, 1895, pp. 256-271.

region, are considerably increased during these "good years." Cotton raised thus is called *algodón de lluvia* (rain cotton) to distinguish it from that cultivated with irrigation.

In the usual dry years in the valley of Piura the ground must be ready for planting before water arrives in the river channels. The soil is well soaked then and the cotton planted. Water generally reaches the valley at Piura in January or February when the equatorial rains are falling in the interior and the mountain snows are melting fast. A limited amount of water is then available during some three months, after which none can be had until the following year. Picking time comes during June, July, and August. Newly planted fields yield their first crop after about eight months' growth. A second crop may be gathered shortly after Christmas, but growers usually find it more profitable not to endanger the plants by interrupting the process of irrigation at that time and so pick but once a year. Some cotton is being picked, however, during almost the entire year in valleys where the native plant is grown.

In the series of valleys near Lima, those of Chillón, Rímac, Chancay, Huacho, Pativilca, Santa, Lurín, Mala, Cañete, Chincha, and Pisco, Egyptian (upland) cotton is grown more largely than the native species. Of these valleys, Chincha is the most productive. Here the heat is modified by winds from the sea. The soil is deep. So porous is the sandy ground, however, that it is difficult to secure sufficient water for irrigation. Consequently after the soil has been well soaked in February and March the surface is pulverized to prevent escape of the precious liquid. Planting then comes in May or June, and the crop is picked about the first of the following May. In the upper part of the valley, where water arrives earlier, planting at times is done in October. Even if planting is done during December and January a good crop may be harvested in July and August.

Pisco valley is more fortunate in having a permanent water supply. Beginning with October there is an abundance throughout the entire summer. There is even enough in this river to allow some to be "lost in the ocean." Here planting takes place in October or November, considered by all the most favorable season, since the plants become large enough by February to shade the ground from the extreme heat of that month. Egyptian cotton is here the favorite variety. The stalks, cut close to the ground after each crop, bear for four or five years before dying. The native plant is not cut but continues to bear on the same stalk for several seasons.

In the valley of Ica, farther south, where water is extremely scarce, native cotton is grown almost exclusively. At times several years pass without enough water for irrigation in the lower valley, and one watering a year is sufficient for a good crop. The soil is sandy, the water sinks deep into the ground, and many schemes are resorted to in order to secure the underground supply.

FIG. 2

FIG. 3

FIG. 2—A typical cotton field in Minas Geraes, Brazil. The depressions between hills or mountains, the lower part of mountain sides, and the land along the banks of small rivers are the places most frequently utilized. (Courtesy of Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce.)

FIG. 3—Picking cotton at the Piracicaba Agricultural School, São Paulo, Brazil. (Courtesy of the Pan American Union.)

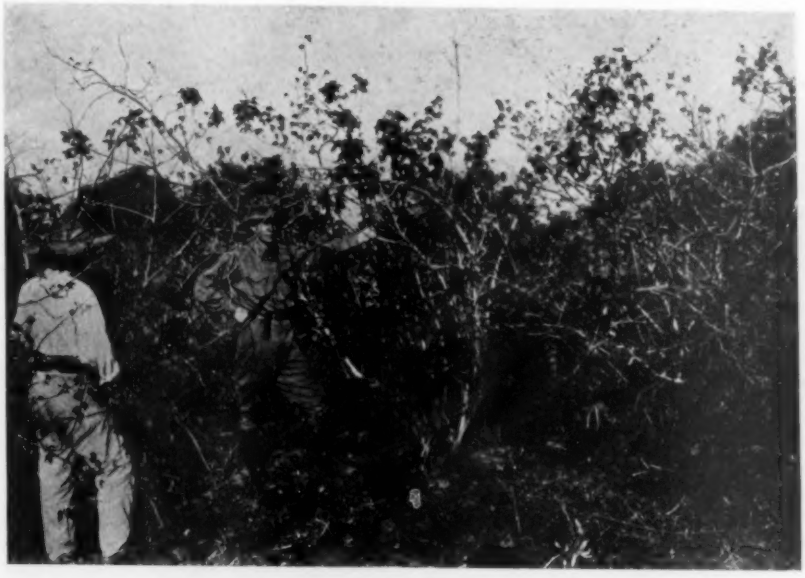

FIG. 4

FIG. 5

FIG. 4—Cotton trees at São Joaquim (Santa Catharina?), thirty-five years old and still producing. They were cut back every other year.

FIG. 5—A cotton farm near Coroatá on the Rio Itapicurú, Maranhão, Brazil, showing the appearance of a field in October. The condition seen explains, in part, the reason for poor grades in Maranhão cotton. (Figs. 4 and 5 courtesy of Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce.)

Production and Destination of Peruvian Cotton

While the greater portion of the Peruvian cotton is shipped to England and the United States, there are several textile factories in the country that handle a part of the crop. Most of these mills are located at or near Lima. They produce the coarser fabrics in demand at the local markets. A quite modern mill, partly operated by electricity, has been opened recently in Arequipa, and here some of the cotton from the southern valleys is made into cloth, largely for the homely needs of the Bolivian and Peruvian highland populations. The cotton produced in Peru is usually ginned near where it is grown, and, because of the scarcity of wood and coal, cottonseed is used for fuel in the gin engines.

Labor

Labor is an old problem in the Peruvian coast valleys. In colonial days it was solved in part by the importation of negroes. When the negro slaves were freed in the middle of the last century dependence was placed on Chinese laborers, and many coolies were introduced. Later Chinese immigration was stopped, and its place has not been filled, though a number of Japanese have entered the country. As most of the colonizable land of the coast valleys pertains to large estates there is little hope of attracting European labor, and chief dependence must still be placed on the Indian population. Peons are attached to most of the large estates. The peons, who are virtually serfs, are not free to hire out on other farms. As no estate can support a very large number of peons there is frequently a scarcity of labor at the short season during which irrigation is possible. There are few towns or cities or even densely populated rural districts from which labor can be recruited. In places a transfer of workmen between upland vineyard and coastal cotton lands has been possible. When, as often happens, the vintage season coincides with the arrival of the water in the late summer, a double shortage of labor is experienced. Indians from the high sierras descend to some of the valleys for the planting or picking season, returning immediately thereafter to their cool mountain homes. Some landowners have been forced to adopt a plan of renting on shares, either to their own peons or to free laborers whom such offers would attract. This, however, is not so profitable to the landlord as the favorite Latin-American peon system inherited from colonial times.

Transportation

In the isolated Peruvian valleys the problem of reaching a market is often a vexing one. Miles of desert separate centers of production from the towns. The lower parts of the valleys are in some cases absolutely barren, affording no sites suitable for the location of settlements. Railroads, however, have now tapped all of the principal valleys, and tiny ports line

the Peruvian coast to handle the produce of the valley oases. Human carriers, mules, and donkeys move the cotton in small bales to railway points. Cheaply constructed coastwise steamers (*caleteras*) touch at the various ports, collecting produce and carrying it to the more important points where ocean liners load it for export.

Official estimates place the cotton yield of the entire republic for the 1915-1916 season at 27,600 metric tons.[6] This is not an impressive amount—it leaves Peru tenth among the cotton-growing countries of the world[7]—but it shows good and hopeful progress.

Possibilities of Increased Production

At present there are about 140,000 acres planted in cotton. This amount is being increased steadily and is capable of a still greater extension. The districts of Chira and Pisco offer the greatest possibilities, since they are well supplied with water. Besides the valley floors, to which the present cultivation is almost entirely limited, there are considerable areas of interfluvial grounds that will produce when water is brought to them. Foreign capital is needed for this enterprise. Given modern systems of irrigation and some solution of the labor problem, perhaps by increased use of mechanical aids, this desert coast of Peru, with its ideal climatic conditions, should easily multiply its yield many times and contribute an appreciable part of the world's cotton, though it offers no such possibilities as do the extensive uplands of Brazil or the plains of northern Argentina.

Brazil

Cotton was used in Brazil before the arrival of the Portuguese (1500), though it was not under cultivation, as in Peru. The Indians employed its fiber to make cords for their bows, to weave sleeping nets (*hamacas*), and even to make the scanty clothing which the climate required. During colonial times the Portuguese developed the industry, cultivating cotton and establishing textile factories. In the absence of coin, cotton thread and cloth were circulated as money in some parts of the colony. As negro slavery became more general the cultivation of cotton grew, and, by the end of the eighteenth century, Brazil ranked as one of the foremost cotton-producing countries of the world. Maranhão, Pernambuco, Bahia, Rio de Janeiro, and Pará all figured prominently among the ports from which the raw material was shipped. Brazilian cotton, at this period, formed about 8 per cent of the amount used in English mills and supplied the principal stock of the finer qualities. So profitable was the production that cotton was transported from far inland on the backs of mules, the journey

[6] C. R. Paz: Estadistica de la industria algodonera en el Perú, año 1915-1916, abstracted in the *West Coast Leader*, May 5, 1917, Lima.

[7] Cotton Production and Distribution, Season of 1915-16, *U. S. Bur. of the Census Bull. 134*, Washington, D. C., 1916.

sometimes requiring several months. The invention of the gin in 1793 made North American competition too keen for less progressive Brazil, and her proportion of the world's trade gradually diminished, though the production for home consumption continued to be considerable. When the Southern ports were blockaded during the Civil War, Brazil again came to the front as a source of supply for European mills, but the boom was short-lived. Since that time Brazilian cotton has been consumed largely by local factories. Little of it enters European trade, though probably more is raised now than at any previous time in the history of the country.

Distribution

The cotton plant grows wild or cultivated over the entire republic. Branner reported in 1885 that he had seen it growing in nearly every province and cites authorities to show that it is raised, at least on a small scale, from the Araguary in Brazilian Guiana to Porto Alegre in Rio Grande do Sul, along the Amazon, the Tapajoz, the Madeira, the Rio Negro, in the Matto Grosso region, and along the upper waters of the Paraguay.[8] Production for commercial purposes, however, is limited almost entirely to the states along the northeastern coast, a small district west of the city of São Paulo, and a few localities among the hills of Minas Geraes. In the northeastern angle of Brazil the coastal plain, though often very narrow, at places attains a width of 100 miles or more. The cultivated areas of this strip, as also of the lowest river valleys, are devoted chiefly to the production of sugar. They are too moist for cotton culture.

Back of this coastal belt, at a distance which varies from 30 to 200 miles, the land rises to a height of several hundred feet. A greatly broken surface, some 500 feet or more in elevation, interrupted in places by higher remnants of ancient mountain ranges, extends far inland toward the low basin of the Amazon and Paraguay river systems. This upland is known by various names in Brazil, according to the amount and character of its vegetation. The plateau consists for the most part of open woodland in the better-watered sections, great areas of bush country, and vast stretches of prairie. Few dense forests are found. Over the entire high interior there are marked rainy and dry seasons, most of the precipitation taking place in the summer months, while the winter is clear and dry. During the dry winters trees lose their leaves and grass dries up except in the more favored regions; but there is little change of temperature from month to month.

It is on the seaward margin of the plateau that both coffee and cotton have been extensively cultivated. Coffee production has centered in the states of São Paulo, Rio de Janeiro, and the southern part of Minas Geraes. Cotton growing is distributed chiefly on the highlands that border the

[8] J. C. Branner: Cotton in the Empire of Brazil, *U. S. Dept. of Agric. (Miscellaneous) Special Report No. 8*, Washington, D. C., 1885.

coastal belt farther north in the states of Bahia, Sergipe, Alagoas, Pernambuco, Parahyba, Rio Grande do Norte, Piauhy, Ceará, and Maranhão. It is seldom found below the 500-foot contour, or above the 2,000-foot line.

While the coastal belt, with the exception of that part lying between latitude 3° and 5° S., has abundant rain (40 to 60 inches), the interior, where the bulk of the cotton is grown, falls within the climatic division of the semi-arid northeast. Here large areas have a rainful averaging 15 inches or less, marked furthermore by irregularity from year to year. The droughts of Ceará are notorious for the wholesale depopulation occasioned through famine and migration. The drought of 1877-1879 was the most disastrous, as it came after years of prosperity during which the acreage devoted to cotton was greatly increased. In the region liable to drought a sure basis for increased cultivation must depend on irrigation by storage, work which is now under progress. Droughts apart, the climate is excellently suited for cotton cultivation.

The landward limit of the cotton belt of northeastern Brazil is fixed more by accessibility to markets than by climate, since general meteorological conditions vary but little over the Brazilian plateau.[9] In the São Paulo region, where coffee and cotton enter into competition, meteorological factors are influential. The frosts of the winter of 1918, for instance, worked serious havoc in the coffee plantations. To replace their loss planters have been tempted to turn to cotton as a crop yielding a quick return.

The character of the soil is also a factor determining the division of the cultivated areas on the higher lands between coffee and cotton. In the coffee district the soil is a dark red diabase, rich in iron, and when rains set in everything becomes covered with sticky red earth. The soil is said to be peculiarly suited to coffee production. On the other hand, cotton is generally grown on the soils formed from the great sandstone and limestone deposits which characterize a large part of the northeastern uplands and the valley of the São Francisco.

Methods of Cultivation and Varieties Grown

Modern methods of cultivation are practically unknown over most of Brazil. Cotton is grown chiefly on small farms and in about the same manner as it was two hundred years ago. The timber or bush is cut and allowed to lie until thoroughly dried; then it is burned, and the cotton is planted among the stumps and charred logs, with almost no effort to break the ground. Planting takes place when the first rains come and hence varies from December to April or May, being earliest in the north and on the higher grounds. The crop is picked as it matures. Picking sometimes extends throughout the dry season. This circumstance has given

[9] The best descriptions of the climate of Brazil are contained in C. M. D. de Carvalho's "Climatologie du Brésil," London, 1916, and in his "Météorologie du Brésil," London, 1917 (reviewed in *Geogr. Rev.*, Vol. 4, 1917, p. 411).

the impression that there is more than one crop a year; but Branner, after investigation, asserts that such is not the case in any part of the country.[10]

As in other South American countries the tree cotton, mostly indigenous, is cultivated extensively, especially upon the drier regions of the uplands. This hardy plant grows for many years, though it seldom yields well for more than two or three. Its fiber is long and silky. The annual herbaceous varieties require more moisture and more careful cultivation but produce a larger quantity of fiber. Sea Island plants have also been introduced with good results in a few regions where the water supply is more abundant. The *arboreo* is of slow growth, bearing a crop only after from nine to twelve months, while the *herbaceo* requires but six to mature.

Production

Export figures fail to reveal the production of cotton in Brazil because, as in China, the fiber grown has been consumed almost entirely within the country. An extremely high import duty, 7.27 cents per pound, has tended to keep out foreign raw material and has fostered home manufacture. There are now over two hundred mills manufacturing cloth. A decided stimulus to this industry has been felt since the beginning of the war, scarcity of British manufactured textiles having forced Brazil to depend more upon her own output. It is only within recent time that the by-products have been considered, but cottonseed is now being utilized by presses in São Paulo to such an extent that the importation of cottonseed oil has almost entirely ceased.

Efforts to Encourage Production

In recent years the cultivation of cotton has been encouraged through the official Servicio do Algodão (now under the direction of an American expert). Great efforts are being made not only to render Brazil independent of foreign raw material but, by stimulating the textile industry, to place the country among the world's large exporters of cotton and cotton goods.[11] During the months of May and June, 1918, an exposition of Brazilian textile industries was held in Buenos Aires for the purpose of extending the output of the country's factories in the important markets of that city. As a result of these efforts reports for 1917-1918 show an increased cultivation of cotton in Brazil, and her production was estimated to be about 400,000 bales.[12] A setback to production is the boll weevil, which in late years has become a very serious menace to the Brazilian crop. In 1918 the estimated damage amounted to over $27,000,000. Alagoas and Ceará suffered most heavily, losing two-thirds of the cotton planted. State

[10] *Op. cit.*, p. 82.

[11] *Commerce Repts.*, June 19, 1918, pp. 1078-1080.

[12] **Cotton Growing in Latin America.** *U. S. Dept. of Commerce, Latin-American Division, Circular No. 84,* Washington, D. C., 1918, and *Commerce Repts.*, June 22, 1918, p. 1127.

and federal governments, however, are taking precautionary measures to check this pest, and, in spite of such losses, larger areas were under cultivation in 1918 than ever before.[13]

Possibilities

In considering the future of cotton in Brazil those who have studied the situation have used extravagant terms. Branner says: "The territory in Brazil capable of yielding cotton is coextensive with the empire itself." An experienced American expert, after studying the cotton situation there recently reported that "Brazil is a natural cotton country and possesses an ideal climate for this crop. . . . . The continued supremacy of the United States in the production of cotton depends wholly upon the continued dormancy of Brazilian agriculture."[14] Others have described Brazil as "potentially the greatest cotton-producing country on earth."[15] As far as climate and soil conditions are concerned production has far from reached its limits. The whole northern section of the plateau varies little in temperature from month to month and, in most sections, receives sufficient moisture during some part of the year to insure a fairly abundant growth of cotton, while the long mild winters, with months of sunshine, few frosts, and no storms, afford favorable maturing and picking seasons. Parts of the lower Amazon basin will probably be found suitable also.

Labor and transportation are the factors that limit the possibilities of largely increased production in the near future. The plateau region is very poorly supplied with navigable streams. Such rivers as the São Francisco and the upper Paraná, while navigable in long stretches of their courses, are impeded by rapids or falls where they descend from the plateau. A gradual extension of railways into the interior will ultimately provide transportation facilities.

As for labor, even the present demands cannot be supplied. Neither the far-reaching raids carried on by the early Paulistas in quest of Indian slaves, nor the importation of large numbers of Africans in colonial times, nor the phenomenal immigration of years immediately preceding the war have provided sufficient workmen for the increasing demands, even of the coffee crop. Owners of *fazendas* (plantations) find it difficult to secure permanent colonists. Each season witnesses a movement of workmen with their families from one farm to another in search of better living conditions. The establishment of factories, too, has attracted many laborers to the cities, and migration from country to town is taking place in Brazil, as everywhere else, to a remarkable extent. But with increase of population and improved means of transportation it seems probable that Brazil will become one of the very important sources from which raw cotton will be exported to the world's markets.

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[13] *Commerce Repts.*, April 4, 1918, p. 49.
[14] *Daily Consular and Trade Repts.*, Sept. 12, 1914, pp. 1391-1392.
[15] *U. S. Dept. of Commerce, Latin-American Division, Circular No. 34*, p. 3.

Argentina, Paraguay, and Lowland Bolivia, Regions Adapted to Cotton Growing

Though as yet scarcely figuring in the world's markets, northern Argentina, with the adjoining parts of Paraguay and Bolivia, has long been looked upon as offering one of the largest available areas for cotton culture. Except in the highlands of the northwest, the climate is sufficiently mild, the temperature is constantly moderate, and the rainfall, which nowhere exceeds 40 inches, occurs mostly in the spring and summer months, the winter season being dry. In this section are situated extensive sugar-cane estates, where rainfall is sufficient, or where, as about Tucumán, irrigation is possible.

So promising were these regions considered for cotton production that in the great shortage of our Civil War an effort was made by British interests to encourage cultivation there. A measure of success was met with in many places, even with the handicap of great distance from market.[16]

In 1906 the Argentine Ministry of Agriculture sent an expert to study the provinces of the north with a view to establishing so-called "cotton colonies" there. The report submitted[17] found that most of the low plains in that section of the country and the valleys not higher than 1,000 meters are suitable, in climate and soil, for cotton cultivation. Plants were found growing wild in many places, and cotton growing on a small scale was common. Little progress, however, was made in the establishment of cotton colonies. Until the stimulus of war-time prices production was practically limited to those colonies of the Chaco advantageously situated near Barranqueras, port on the Paraguay. But at present renewed efforts are meeting with greater success. Communities which had been producing textiles only for their domestic consumption have begun to extend the area under cultivation with the hopes of profiting by the high prices offered.[18] In 1916, according to the *Estadística Agrícola* (1916-1917), the area under cotton was 7,500 acres, almost all in the Chaco Territory. The following figures published by the Argentine Department of Agriculture show the area planted in cotton during the season 1918-1919 distributed according to provinces:[19]

Corrientes	927 acres
Chaco and Formosa	31,061 "
La Rioja, Jujuy, Misiones, etc	692 "
Total	32,680 acres

[16] See M. G. Mulhall: The Cotton Fields of Paraguay and Corrientes, Buenos Aires, 1864.

[17] J. B. Massé: Rapport sur la création de colonies cotonnières nationales, *République Argentine, Annales du Ministère de l'Agric., Sect. Écon., Commerc. et Indust.*, Vol. 1, No. 1, Buenos Aires, 1906.

[18] *Commerce Repts.*, March 11, 1918, p. 916.

[19] *Commerce Repts.*, April 22, 1919, p. 495.

Extension of Production

As regards climate and soil this section of northern Argentina, with the similar contiguous regions of Bolivia and Paraguay, offers an area suitable for cotton growing that far exceeds in extent the 30,000,000 acres of the cotton belt in the United States. But the problems of labor and transportation make extensive cotton growing not an immediate possibility. At present sugar is the chief cultivation, and for the sugar estates much of the labor is furnished by Indians from the Chaco of Argentina and Bolivia. This would probably never prove a satisfactory supply for the cotton fields. It is too uncertain and would be too hard to train. But Argentina's phenomenal immigration, if resumed when normal world conditions shall have been re-established, will gradually solve this problem. As for transportation, regular steamer traffic on the Paraguay River simplifies the problem in the east, and the usual South American tendency towards government-owned railroads, built not in response to production already established but rather as a means of developing promising regions, may be counted on ultimately to provide facilities for the interior districts.

Other South American Countries

In former years, when there were no great cotton countries, the Guianas furnished an important percentage of the world's production. In 1827, 16,000 bales were exported from British Guiana. Dutch Guiana at one time supplied the British mills with much of the finer quality used.[20] But the regions in which cotton cultivation is possible are very limited. The narrow coastal belt, in many places actually below the level of high tides, is too humid to favor cotton culture, though admirably suited to sugar and rice. The interior uplands, exposed to the northeast trades, receive on their Atlantic slope over 100 inches of rain distributed throughout the year. Farther inland are found extensive savanas, where, because of lighter rainfall, grasslands replace the forests of the Atlantic slope. But over all of these highlands there occur marked changes of temperature that make extensive cotton cultivation unlikely, even when settlements and railroads reach that most inaccessible region.

In Venezuela the district about Valencia is the chief center of cotton cultivation, which is still on a very small scale. The crop is consumed locally, the mills producing a coarse, inferior cloth. In the interior of the country, the great grasslands, the *llanos*, offer many thousands of square miles where cotton might possibly be grown, though the climatic conditions are not sufficiently known to warrant a positive conclusion. This region, too, possesses a scanty population, apparently less numerous now than one hundred years ago, and means of transportation are quite primi-

[20] J. A. Todd: The World's Cotton Crops, London, 1915, pp. 97, 204.

tive. It must be long before the *llanos* are anything more than a pastoral country.

Colombia's great eastern lowland territories offer similar conditions of climate, soil, and settlement. In her northern provinces, Bolívar, Atlántico, and Magdalena, she produces a small quantity of long staple cotton, some of which is exported while North American raw material is imported for use in her local mills. The lower basin of the Magdalena, to which cotton cultivation is principally limited today, is well suited in climate, soil, and location to become an important center of production.

In Ecuador, over a small area about Guayaquil and in the province of Manabi, some cotton is grown, but very little territory in this country will ever offer a field for its extensive cultivation.

The same may be said of Chile and Uruguay. Chile's northern provinces, where temperature conditions would be favorable, contain little arable soil and almost no water. Her southern sections lie beyond the latitude where cotton can become a staple product. Uruguay, like central and southern Argentina, is subject to sudden and extreme fluctuations of temperature.

Conclusion

The possibility of cotton growing over wide areas in South America has been demonstrated by the success already achieved. Commercial production on a large scale must necessarily depend upon the other factors mentioned as well as upon the suitability of climate and soil. But the problems of labor and transportation are capable of solution—are being solved at the present time in some of the most important sections. South American countries confidently expect that foreign capital will be available for the development of irrigation where that may be required. It would seem that this great, politically independent continent, lying almost entirely within the tropical and subtropical zones, in which cotton exists as an indigenous plant and in which it has been successfully grown in many places and for many centuries, offers a field that is well worth the attention of those who are interested in extending the production of this indispensable fiber. Though not an immediate possibility, it seems safe to predict that the great highlands of Brazil and the plains of northern Argentina, Paraguay, and eastern Bolivia, with the more limited coastal valleys of Peru, may eventually compete with the cotton belt of North America and vie with Egypt, India, and China in supplying the world with its most important item of international trade.

THE PAYS DE MONTBÉLIARD

By PIERRE CHAVANNES

Its Distinctive Personality

The old *pays* of Montbéliard is no longer to be found on political maps of France. When the geometricians of the Revolution split France into fragments, Montbéliard caused a difficulty. It had been united a little while previously, and they tried adding to it Haute Saône, Haut Rhin, and Mont Terrible in succession, for it was Vosgian on the north, Alsatian in the east, and Jurassic on the south. Only in 1816 did the administration solve the problem by dividing it among the three, but even this rough treatment has not destroyed the unity of its people, who know and love their *pays,* recognizing its distinctive personality while none the less playing their part as Frenchmen. The very last invasion, by the welcome American soldiers, showed its sense of the individuality of the *pays,* for the men joined with the villagers in singing, each in his own tongue, the hymns of the American evangelists Moody and Sankey. This Protestantism of Montbéliard is by no means its only distinctive feature. Who that knows the Swiss religious boundaries will need to be told of the many subtle differences that accompany this deep one? The personality of a country is an outcome of a long effort, and, when the struggle is against overwhelming odds, as has been the case with Montbéliard, the maintenance and enrichment of that personality is matter for profitable study. While some districts cannot but develop and maintain a personality, Montbéliard, only twelve leagues by six, seems at first sight cut off from even this possibility. Within its narrow limits are both high plateaus of the Jura and the outposts of the Vosges, while between them lies the open plain.

Its Physical Diversity

On the Jura flank we have the chain of the Montagnes du Lomont, with their short sweet grass and their tufts of beech, descending step by step into the busy industrial plain. These steps are built of dry limestone plateaus, where the wild mistletoed pear tree struggles for life on the stony pastures, where bushes of hawthorn and privet and, down below, small woods are the only things that relieve the nudity of the poor grass, easily withered by the sun's rays on these thirsty rocks. But there are green and fertile valleys even here wherever the clays, which hold the water in large subterranean sheets, reach the surface on the flank or at the bottom of the narrow valleys and abundant springs gush out from the rock.

Towards the Vosges the heavy red earth appears, and it gives place in turn to the schists and porphyries and sandstones of the outposts of the

old mountain mass. Here are streams everywhere, and the soil is deep between the rounded hilltops where reign broom and heather and ferns, as they do on the moorlands of Brittany or Limousin.

The plain between the two hill districts is no more unified than they are. Calcareous patches remain in districts that belong really to the north, and the Vosgian rocks show through here and there in the calcareous part of the plain. The calcophile and calcophobe floras carry the same contrast into the realm of life. Towards Luxeuil and Belfort we have red sandstone towns, while Montbéliard is of the beautiful gray stone that gives such a dignity to the old ecclesiastical city of Besançon. And so the contrast works on through all spheres.

Its Character as a Gateway

So far from destroying its individuality, the intimacy of these contrasts actually gives the *pays* its character. But it is not only Vosges and Jura that meet in the plain. Alsace penetrates the great Gate of Belfort; the strange course of the Doubs is finally turned towards the Saône and the south; there is contact with Lorraine on the northwest and with Switzerland on the southeast. The plain with all its contacts is the essence of the *pays,* and the two hill borders are, as it were, the lintels of the fateful door through which have streamed for ages, in one direction or another, peoples and armies, races and civilizations, processes and ideas. How can a mere passage land have a personality? Each movement must surely obliterate the work of its predecessors or combine with them to form a mere characterless composite photograph. So it might be were it not for the powers of resistance that human nature manifests, intensifying its character best perhaps in the face of opposition. In this case the great and fateful opposition has been between the Franco-Roman and the Germanic, between the West and the East. The little *pays* has been seized and tossed about many a time, as have all the lands of France's northern aureole between the sea and the Alps; but of old it felt the struggle even more than did its fellows, for it was at the great gate. Its people have had to stand always ready and have learned their lesson of self-dependence, selecting from both sides but remaining true to themselves.

Roman Conquest and Barbarian Invasion

Such a point of vantage appealed to Roman skill, and, after Caesar's conquest of Sequania, Augustus made a military camp in the *pays* while Agrippa transformed prehistoric tracks into roads for commerce and law and taxes of the empire. His roads can be followed today from the Doubs through the Belfort gate to Basel and the Rhine. Sequania quickly became Gallo-Roman, and the center of the future *pays* was the old Celtic town of Mandure on the Roman road. It was transformed by Agrippa into the Roman city of Epamanduodurum, with forts, temples on its hills, aque-

ducts, arenas, a forum surrounded by portals, and a theater larger than the one at Orange. Under the Romans villas spread along the roads, *coloni* and serfs cleared the valley woodlands and grew wheat, the town became a great market for horses (still reared on the Jura plateaus), the gardens

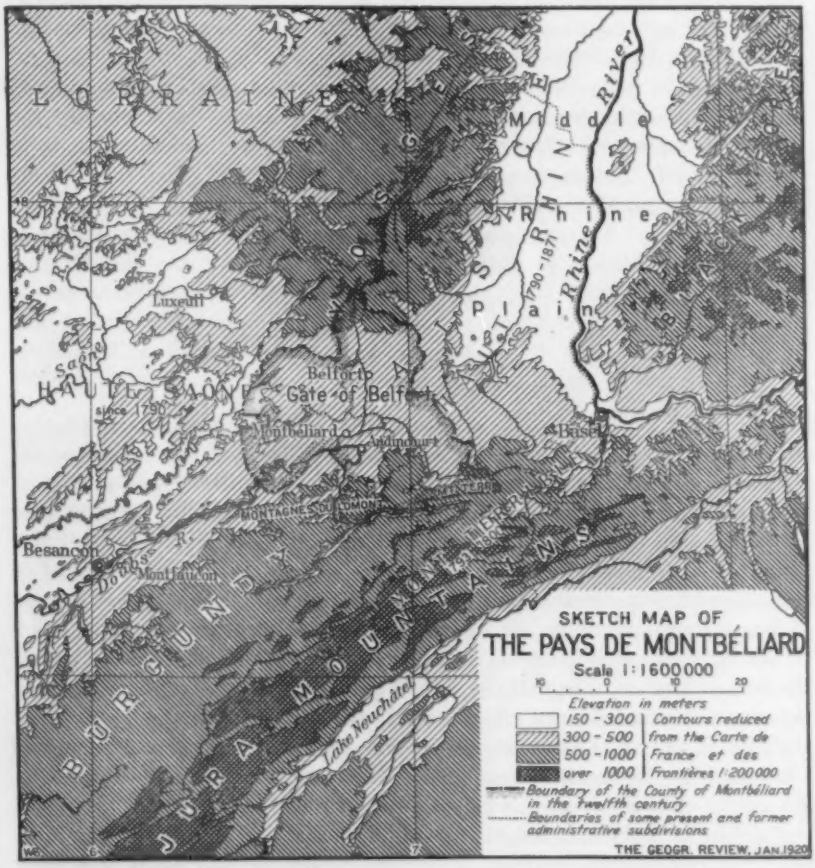

FIG. 1—Sketch map showing the physical features and historical development of the *pays* of Montbéliard. Scale, 1:1,600,000.

The *pays* lies in the Gate of Belfort, the threshold between the Middle Rhine Plain and the Saône-Rhône depression. The County of Montbéliard is shown in its greatest extension, in the twelfth century (based on F. Schrader: Atlas de Géographie Historique, Paris, 1911, Pl. 22). The boundaries are also shown, by faint dotted lines, of the present and former French *départements* among which the territory of the County was divided: Haute Saône, unchanged since its establishment in 1790, occupying the upper basin of the Saône: Haut Rhin, 1790-1871, equivalent to Upper Alsace; and Mont Terrible, 1793-1800, practically equivalent to that portion of the present Swiss canton of Bern known as the Bernese Jura (the last based on map of Bishopric of Basel in Dictionnaire Géographique de la Suisse, Vol. 1, Neuchâtel, 1902, p. 155, and map of the Helvetian Republic, 1798-1802, *ibid.*, Vol. 5, 1908, facing p. 564). The name of the last *département* was based on a misinterpretation of the name of one of its prominent features, Mont Terri, an arid, limestone ridge of the Jura Mountains (*terri*, dialectical for *tari*, waterless). The retention in some current maps and works of the name Mont Terrible for the ridge does not conform with best usage (Dict. Géogr. de la Suisse, Vol. 5, p. 643).

became filled with walnut, chestnut, plum, and cherry, and peach trees which the Romans had brought from Asia, and finally imperial taxation was added to all these gifts, without adding to their charm.

Christianity followed the legions, and Vesontis (Besançon) for a short space became a sort of Christian capital; but the empire was decaying, and the barbarians soon spread through the great gate. Julian strengthened its fortifications, but along lines that made the *pays* thenceforth only an outpost soon to be lost. Then the story is of Burgundians and of Vandals and after them of the terrible Huns who burned Epamanduodurum; it is a story of ever-renewed efforts to remake the barrier after each invasion, until despair set in. The frontier line is the index of history. Then the tyranny of the barbarian chief replaced that of the Roman tax gatherer. Frank succeeded Burgundian, and the *pays* became a part of Elsgau, allocated at the treaty of Verdun to Lothair I and thus brought into the Empire. During long, confused years the old Romanized Celtic indigenous people slowly assimilated its conquerors, taught them its remarkably distinct and pure dialect of the *langue d'oïl*, though Alsace was Alemannic, and made the Burgundian and Frankish farmer into a sort of rural version of the lord of the Gallo-Roman villa.

Its Rise to Independence

The position of Montbéliard gave it a special importance in the days of moving peoples, and, as the movements subsided, it rose for the first time to political unity and independence under Louis de Mousson-Montbéliard, Count of Montbéliard in 1034, and a powerful feudal seigneur. Related to Pope Leo IX and a descendant of Pepin d'Héristal and married to a niece of Hugh Capet, Louis had indeed much to strengthen his position.

The old fight, with the names of France and Burgundy and the Empire to the fore on the one side, and the counts, famous in battle and in pillage, on the other, gravitated for a while towards the Empire; but the accession of the French House of Châlons tilted the scale the other way, and that was continued by the second House of Montfaucon. They were succeeded by the counts of Württemberg, who split away from Burgundy and, under the leadership of Lorraine, helped to ruin Charles the Bold. During these centuries once more, by playing off one power against another in war and diplomacy, the *pays* managed to maintain its virtual independence under the shadowy suzerainty of one or other side.

In the course of the princely wars the bourgeois gradually seized the reins of government and took part against their princes. By these means there arose all along the great war zone from Flanders to Switzerland that strong municipal life that has left us witness of itself in its *hôtels de ville* and its belfries whence the tocsin called men to defend the civic life. In 1283 the citizens of Montbéliard gained a remarkably strong charter freeing them from all dues to the seigneur save a tax of 12 deniers per fathom of house façade.

Eighteen bourgeois were to be elected by their fellows each year, and they in turn chose an executive of nine for judicial and police purposes; so that in this little aristocratic republic the citizens were judged and ruled by their peers. The nine were required to add three other notables to their number when there was very serious business to discuss. The charter shows a curious foretaste of Rousseau, as it were, for it says that the town is ruled by "*le magistrat*," meaning not an individual but the whole governing body considered as a collective personality including over and above the specially elected men the whole of the town's notables. This system lasted on from 1283 to the Revolution, that is 510 years—a sufficient proof of its strength. When Bernard de Saintes announced in 1793 that he brought the town liberty, the chief bourgeois, Ferrand, could well retort that he was mistaken, for they had long known it.

Its Religious History

History would have been different had Cleopatra's nose been longer, and, if an heiress of Montbéliard in 1397 had been affianced, like her sister, to a French notable and not to Eberhard of Württemberg, the story of religion in the *pays* would probably have worked out very differently, and its character would have been other than it is. Montbéliard, lying in the Gate of Belfort, feels all the winds of heaven, the mild westerlies with their rain alternating with the dry cold winds from the east. Similarly it has felt the four winds of the spirit, the streams of ideas along the great roads of migration used alike by man and bird. It was notably in the stormy sixteenth century that Montbéliard felt the streams of ideas moving between Lyons on the one hand, with its great market and printeries at a safe distance from the repressive Sorbonne, and Strasburg and Basel on the other, or between Geneva on the one side and Lorraine and France on the other. It became early a place of refuge for persecuted French Huguenots, and its Württemberger count Ulrich, who protected the humanist Reuchlin and hated the monks, naturally looked towards Basel, whence were sent Farel and Toussain. These preachers easily roused the people against the decadent Church and gave the Reformation in Montbéliard a strong Calvinistic flavor; but the princes, with their German connections, later modified the religious organization in a Lutheran direction. Protestant Montbéliard accepted the Augsburg Confession and a somewhat episcopal system; but the princes could not drive away the Huguenot intellectuals, and the spirit remains Calvinistic though the form is rather Lutheran. A very similar feature is noticeable in the Channel Islands, for, though Charles II forced them to accept the Act of Uniformity (1661), the Calvinistic spirit retained the leadership, at any rate until the rise of the Oxford movement. The staying power of the Calvinistic spirit has made it a mighty factor in molding not only the Protestant parts of France but also Germany, Holland, Britain, and the United States.

The Protestants of the *pays* in the sixteenth and eighteenth centuries studied for the ministry at Tübingen, and the German element thence derived was of value as contributing a vein of pious mysticism to leaven the theological aridity of the seventeenth century and the rationalistic aridity of the eighteenth. The Moravian influence in Montbéliard, as in many other places, was intimate and quietly powerful, as the wide distribution of the "Sermons de Nordin" in company with the family Bible bears witness.

In the quarrels after the burning of Servetus, Montbéliard took its stand for toleration and for Castellion, who developed an impassioned defense of that principle. Ever since then Protestants of the *pays* have taken a pride in gathering psalms from the Huguenots, chorals from the Lutherans, hymns from America, songs from the latest Welsh revival.

Education

The Reformation in Montbéliard led to the growth of a system of education with the high ideals characteristic of the Huguenot educators—a system including free tuition and stipends for promising pupils at the Latin school. At the top stood an academy teaching theology, law, and medicine; but, when Louis XIV took the town, he scented an enemy there, and the academy was closed—not, however, until it had conferred on the *pays* almost as clear a superiority as Scotland has so long enjoyed for analogous reasons, a superiority, moreover, which is reappearing under modern conditions of liberty. The Reformation usually also allied itself with the printing press, and Montbéliard undertook the printing of theological works on paper made by mills penetrating into the deep valleys of the Jura.

Discussion naturally promoted initiative, and in the latter half of the seventeenth century Montbéliard took its place in the general agrarian movement of western Europe and made large forest clearings, followed in the next century by the beginnings of nineteenth-century industry.

Relations with France

There is no doubt that Protestantism has been a master factor in the making of the personality of Montbéliard, surrounded as it everywhere is by zealous Catholics; but its Protestantism made less of a breach with France than might be imagined. Some French kings were concerned to maintain good relations with their outposts over against the Empire. Louis XIV, however, was brutal enough until the Treaty of Ryswick made him give up his prey, and the Guises were apt to billet their ill-paid troops on the luckless Protestants and to follow up unchecked outrages by courtly letters of regret. The wars of religion were indeed a bad time for the *pays*, and its people often fled to the forests, even though, as Bohain tells us (1590), the wolves were abundant.

The eighteenth century saw the horrors of those wars grade down into petty legal bullying, and Montbéliard retained its individuality under its prince, whose position at the great gate kept him from degenerating into a comic opera puppet like so many of the other rulers in the minutely divided Germanic lands near the Rhine. His court was a dignified one, as pictured in the memoirs of the Baroness Oberkirch, and to it came thoughtful men of letters and science, the forerunners of the Revolution, which was to attack so formidably the individuality of Montbéliard. Those thinkers, in an atmosphere of education, brought the people of Montbéliard into close sympathy with revolutionary France, though the princes would have preferred to keep the link with Württemberg, the pastors that with Tübingen, and the men of law that with Stuttgart. Montbéliard crystallized out on the French side, Württemberg on the German, and so they naturally drifted apart, though they kept more than one reminiscence of old relationships. The Celtic Gallo-Roman foundation determined the evolution of Montbéliard, the Germanic that of Württemberg. The folklore of the *pays*, for example, is quite Celtic in its ideas about fairies, save that Aunt Aria is partly related to Santa Claus.

The Revolution proclaimed Montbéliard a part of France, one and indivisible; and the sad days of 1870 intensified the people's French patriotism: they had to play once more the part of the outpost. The sculptor Bartholdi has carved a wounded lion in the red sandstone cliff commanding the plain, and at the patriotic festival of July 14 the Alsatians were wont to come to commune with their more fortunate fellow citizens, while, in the place of honor before the Germanic market hall of Montbéliard, is the statue of Denfert Rochereau, "to whom our *pays* owes that it remains French." It has been one of the surprises of 1914-1918 that the German did not dare to attempt the Gate of Belfort; his Belgian crime diverted his energies elsewhere.

Effect of Industrialism on Its Character

Nineteenth-century industry has made, as it were, a new region in Montbéliard. Watchmaking, weaving, manufactures of hardware, automobiles, and bicycles have all developed. Many of these industries have been associated with works in Alsace and in Italy, for the purpose of avoiding customs barriers. The influx of Alsatians into the *pays* after 1871 and the spread of Swiss watchmakers and engineers has filled the plain. Men from the hills came down, and workmen arrived from Belgium and from Italy and even from Germany, in the last case mostly to do the rough work the Frenchman hates. None the less, Montbéliard has kept much of the personality it had won from centuries of struggle.

It was an old Huguenot saying that the more blows one aimed at the cause, the more hammers one would break, *"Plus à frapper on s'amuse, tant plus de marteaux on use."* One may truthfully apply this saying to

the personality of Montbéliard. Like the other Calvinist communities it resisted with the great motto, "In God my strength." That is the actual motto in the coat of arms of the County of Montbéliard, "*En Dieu mon appuy.*" But ages of struggle leave their mark, and we must not expect too much in the way of amiability and social elegance in a country of ancient poverty like Montbéliard. It is true that one finds more of these qualities in Flanders and Alsace, which have suffered much from the tramp of armies, but they are rich lands of grass and corn, almost "lands of increment" when once the forests were cleared. They have their *joie de vivre* far more marked than Montbéliard, and they express it naturally through the fine arts. Montbéliard has a hard climate save in spring, and life is a struggle there. If people gathered of old in its towns it was to defend the great Gate of Belfort, and if its rulers welcomed refugees it was to strengthen themselves, much as the Hohenzollerns welcomed and utilized refugees in seventeenth-century Berlin.

Its Celebrities

Montbéliard has had some interesting celebrities. Bohain, the naturalist, was a son of Huguenot refugees; von Forstner, the statesman, was a religious refugee from Austria; and there are many others as well. Bohain founded a botanic garden at Montbéliard with strong pharmaceutical leanings, and he was one of the early protagonists of the potato, as well as its scientific godfather. Another celebrity was Georges Cuvier, founder of the science of comparative anatomy.

Its Bourgeoisie

The Montbéliard bourgeoisie is a solid one, with good doctors, lawyers, teachers, and capitalists, men who may be a trifle slow but are prudent and thrifty and hardworking. They are inclined to cool rationalism rather than to flights of imagination, and this makes their religion somewhat dull and overweighted with mere common sense. There is not here the vigorous realism of the Fleming, nor the glamorous mist of the spirit of the Rhine. The common folk make first-rate foremen and noncommissioned officers. Many other possibilities in them have been checked by the tyranny of industrialism. The quiet solidity just noted owes a great deal no doubt to former relations with Germany, to years of study at Stuttgart and Tübingen; it is closely analogous to the Swiss characteristics of morality without elegance and honesty without radiance. But the vein of mysticism from the Rhine and the Moravian teachers is there none the less. The Swiss have to some extent stirred up the Montbéliardais to emulate them. A Swiss in 1616 established the first iron foundries in Audincourt, and watchmaking was also brought from Switzerland. Though wars have devastated Montbéliard as sadly as Lorraine and though its historical monuments are mostly in ruins or under ground, yet its higher-grade industries have made its villages less

miserable and its houses less fragile than those of its suffering neighbor. They have something of the spaciousness of Alsatian wealth and Swiss comfort about them, just as the cookery in the *pays* has a foundation of tradition of Franche Comté, with borrowings from Alsace and Lorraine. The people are less reserved and suspicious than the poor of Lorraine and of many other frontier zones, and they have a strong initiative which makes them rather ready to emigrate at need. In the eighteenth century they went to Russia. Later they have gone to the New World, to the United States and, more recently, to Canada and to South America. They are industrial democrats in the Protestant plain, and the villages bordering the Catholic hill country are apt to express their anti-clerical bias with some spirit by ringing the church bells long and loud in celebration of the Fourteenth of July, that the silent and often secretly monarchical Catholics may hear and tremble. None the less they are too moderate of spirit for any chauvinism or aggressive nationalism. They rather love a compromise. Up to the present, socialism has remained theoretical, and here we must allow for the persistence of the individual employer, so often submerged elsewhere by the limited-liability company which has accentuated industrial strife.

The *pays* has many interesting industrial agglomerations along the floors of the Jura valleys. As usual, they have swallowed up old villages and are rather amorphous, but they are not composed of sad rows of tenements like the industrial towns of so many British and even French valleys. Here almost every dwelling stands in its garden, and the buildings are dotted about everywhere without plan or order, though industrialism has killed the old beauty of the peasant's house.

Entering into relations with the whole world, industrial Montbéliard has shown itself akin to other industrial areas in the broad humanitarian sympathies of its people, while growing wealth has given it the opportunity of developing the historic sense. May the pushing back of the old menace in 1918-1919 give the *pays* the chance to use its wealth in exchange of ideas between France and Germany and in pursuit of the links between beauty and truth.

SOME RECENT BOOKS ON MILITARY GEOGRAPHY

By DOUGLAS W. JOHNSON

The reader who finds his way to that shelf in the library set apart for books on military geography will today see it much more heavily laden than in 1914. It may interest him to scan the contents of certain of the more recent additions and to gain an impression of their general scope and value. With little difficulty he can separate the new works on this subject into two classes: those written for the purpose of instructing the soldier in the elements of map reading, topographic sketching, and other military duties more or less geographical in character; and those addressed to that part of the public interested in the broader principles of strategic geography.

Military Manuals

In the first class belongs a small volume on "Map Reading and Topographical Sketching" by the professor of drawing in the United States Military Academy, Edwin R. Stuart.[1] As would be expected in a book from the pen of an author occupying Professor Stuart's position, the text is clearly written and is illustrated by a good selection of simple diagrams and sketches in addition to one large-scale specimen topographic sheet. Nine chapters are devoted to map reading and treat the usual range of topics, such as map scales, conventional signs, representation of relief by contours and hachures, and methods of orienting and using maps in the field. Then follow four chapters on topographic surveying and sketching and one on panorama sketching. The book is convenient in size and sufficiently complete for its purpose.

The author of a second work on "Map Reading and Panorama Sketching" modestly conceals his identity under the phrase "by an instructor."[2] In size this book does not differ greatly from the one already mentioned, but it covers a somewhat broader field. Half the text (eight chapters) is concerned with map reading, including sections on lettering maps, map enlargement, and topographic sketching. Panorama sketching receives two chapters, while three chapters are given to the prismatic compass and its uses. Admirable sketches and maps in color combine with the well-arranged text to make a most creditable little book.

Less can be said in favor of Captain Barber's "Military Map Reading and Intelligence Training."[3] The book is of convenient pocket size and

[1] E. R. Stuart: Map Reading and Topographical Sketching. xi and 139 pp.; maps, diagrs., ills. McGraw-Hill Book Co., Inc., New York, 1918. $1.00. 7¼ x 5 inches.

[2] Map Reading and Panorama Sketching. By an instructor. 2nd edit., revised and enlarged. 113 pp.; maps, ills., index. Sifton, Praed & Co., Ltd., London, 1917. 4s. 6d. 7¼ x 5½ inches.

[3] C. D. A. Barber: [Military] Map Reading and Intelligence Training. 179 pp.; maps, diagrs., ills. Penton Press Co., Cleveland, 1917. $2.50. 7 x 4½ inches.

contains some very good sketch maps reproduced in colors; but the text is a strange mixture of unnecessary detail, childishly simple discussions or explanations, and technical descriptions. "Intelligence Training" gives wide latitude to the author's pen, and we read about bomb throwing, how to play games, trajectories of bullets, care of the feet, types of rifles, three ways to crawl on the ground, and other equally related topics. The so-called "Preface" is but a table of contents without page numbers, while only two out of the first twenty-one plates are numbered, and those two apparently wrongly so. As the text contains many cross references to plates by number, and as the unnumbered plates are often without title or any suggestion as to what they represent, the reader is hopelessly baffled. Add the facts that the style is crude and the grammatical construction of the text far from being above criticism, and one is justified in wondering how the book ever came to be published in its present form.

Bryant and Hughes' "Map Work"[4] is a larger volume than any of those previously mentioned and covers a wider range of topics than its title would indicate. The first chapter, for example, discusses elementary principles of mechanical drawing and land surveying, and there are chapters on the uses of the compass, on panorama sketching, and on the methods of making and reporting military reconnaissances. For the rest the usual topics are treated, such as map scales and conventional signs, methods of representing relief, the processes of map making from triangulation through plane-table traversing to contouring, and the principles of map reading. One appendix contains lists of suggested problems and exercises for each chapter, while two others give descriptions of instruments and an explanation of the use of the theodolite. The illustrations are good, and the subject matter is well arranged.

Students Army Training Corps Textbook

One is tempted to place in a class by itself a more pretentious work on "Military Geology and Topography,"[5] the joint product of eighteen geologists and geographers collaborating under the editorship of Professor H. E. Gregory. Those who have knowledge of the valuable services rendered by Major T. E. David, chief geologist of the British Expeditionary Force, and his assistants; by Colonel A. H. Brooks, geologist of the American Expeditionary Force, and his staff; by the seventy or more geologists attached to the German armies; and by other geologists and physiographers actively engaged during the world war in making earth science the ally of military science, will have no doubt of the urgent need of instructing army officers in the principles of geology as well as in topography. They, at least, will

[4] V. S. Bryant and T. H. Hughes: Map Work. 174 pp.: maps, diagrs., ills. Clarendon Press, Oxford, 1918. 5s. 9 x 6¼ inches.

[5] H. E. Gregory, edit.: Military Geology and Topography: A Presentation of Certain Phases of Geology, Geography and Topography for Military Purposes. Prepared and issued under the auspices of the Division of Geology and Geography, National Research Council. xv and 281 pp.: maps, diagrs., ills., index. Yale University Press, New Haven, 1918. $1.25. 9 x 6 inches.

appreciate that a serious textbook on "Military Geology and Topography" should prove most useful in the educational program of any institution giving courses in military training.

When the Students Army Training Corps was established the need for such a textbook became pressing, and the Division of Geology and Geography of the National Research Council undertook to meet the need by enlisting the services of many experts in the two sciences. The volume which resulted may perhaps suffer in some degree from its multiple authorship and from the further fact that it was prepared quickly to meet a national emergency; yet it must take a high place as the most serious attempt ever made to focus the attention of military men upon those facts and principles of geological and geographical science which have proved to be applicable to military problems. There are chapters on rocks, rock structures, and their representation by means of geological maps; on rock weathering and soils; on rivers, lakes, and swamps and their uses in military operations; on the geological conditions of water supply; on plains, plateaus, mountains, and other land forms and the effect of their peculiar topography on warfare; on map reading and, still more important, on the interpretation of land forms as represented by maps; and a final chapter on the economic and military uses of minerals. The book contains over one hundred illustrations, including excellent series of block diagrams by Frederick K. Morris and Armin K. Lobeck. It is a good kind of book and the best of its kind.

Books on Strategic Geography

Among recent books on the broader subject of strategic geography are two small volumes by the British author, Dr. Vaughan Cornish. When the war broke out, Dr. Cornish offered his services as an instructor in geography to assist in training the new British armies by delivering lectures to officers at the various camps and training centers. The promptness with which the army authorities accepted his offer, less than three weeks after war was declared, indicates that they attached much value to geographical training. Later the Admiralty accepted a similar offer from Dr. Cornish, and altogether some ten thousand military officers and a large number of naval officers listened to lectures on the topics which are briefly treated in a little book of short essays entitled "Naval and Military Geography of the British Empire."[6]

The essays cover a wide range of subjects, the group classified under naval geography including discussions of the strategic position of the North Sea in relation to the Atlantic routes, Ireland as the key to Great Britain's naval communications, the relation of British and German North Sea bases, the great sea route via the Suez Canal which forms the geographical axis

[6] Vaughan Cornish: Naval and Military Geography of the British Empire (Considered in Relation to the War with Germany). Lectures given during 1914-16 to officers of the navy and army. viii and 140 pp.; maps, ills., index. Hugh Rees, Ltd., London, 1916. 8¼ x 5¼ inches.

of the British Empire, and Britain's control of the Indian Ocean by possession of its dominating country, India.

The section on military geography includes topics equally varied, from the strategic geography of the Cologne-Essen district, and the belt of territory from Holland to Calais lying between this vital area and England, to the geographic features of Bulgaria and Serbia, which operated as topographic defenses on both sides of the Orient railway route, and the nodal point Constantinople, the strategic importance of which today, as so often in the past, renders it difficult for the Great European Powers to decide its fate.

Many of Dr. Cornish's essays are disappointingly short and superficial. Thus Constantinople receives but two and a half small pages of large type, and Egypt, strategically one of the dominating positions in the world, but three pages. What the author does say is so interesting and suggestive that we wish he had gone farther and deeper.

The same author's "Strategic Geography of the Great Powers,"[7] based upon a single lecture delivered on the flagships of the Grand Fleet and elsewhere, describes the resources in men and material of each of the Great Powers, the distribution of these resources and the facilities for concentrating them at strategic points, and the foreign positions which flank the lines of communication by which such concentration is necessarily effected. Here we find a somewhat fuller treatment of the strategic value of the Constantinople region than is given in his other book. The strategic geography of the Turkish Empire is considered in connection with Germany's grandiose scheme of a Teutonic state reaching from the North Sea to the Persian Gulf, and Germany itself is treated so as to portray its strategic situation in case it should conquer *Mitteleuropa*. In this respect the book deals with a past possibility which already begins to seem remote. Of present value, however, is the author's warning against the menace of an alliance between Russia and Germany, doubly dangerous because of the supplementary character of their respective military and economic resources.

The American will read with special interest Dr. Cornish's ideas on the remarkably favorable strategic situation of the United States and on the high strategic value of the Panama Canal and its natural defenses. He makes an interesting comparison with the Suez Canal and notes that the tropical forests flanking the Panama Canal are barriers against land armies just as truly as are the deserts east and west of the Suez waterway; while a blockade by sea is enormously difficult because two simultaneous operations on a large scale would be required. Dr. Cornish points the way to a fascinating field which must some day be covered in an exhaustive treatise on the strategic geography of the United States and her possessions.

[7] Vaughan Cornish: The Strategic Geography of the Great Powers (based on a lecture delivered during 1917 to officers of the Grand Fleet and of the British armies in France). viii and 114 pp.; maps, index. George Philip & Son, Ltd., London, 1918. 2s. 7 x 5 inches.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Meetings of November, December, and January. The first meeting of the American Geographical Society for the season of 1919-20 was held on November 25 at the Engineering Societies' Building, 29 West Thirty-ninth Street. President Greenough presided. He submitted for confirmation the names of 145 candidates for Fellowship, each of whom had been approved by the Council, and they were confirmed as Fellows of the Society. Thereupon Mr. Frederic Dean addressed the Society on "Siam's Place in the World." The new flag of Siam was displayed on the platform.

During December and January meetings were held at the Engineering Societies' Building on the following dates: December 9, December 23, January 6, and January 20. At all of the meetings President Greenough presided. At the monthly meeting of December 23, 125 candidates were confirmed as Fellows of the Society; at the annual meeting on January 20 the number was 37. The Society was addressed at these meetings by the following persons: December 9, by Miss Florence Parbury, on "Kashmir, the Garden of the East"; December 23, by Mr. Robert J. Flaherty, whose accounts, in the June and August, 1918, numbers of the *Geographical Review*, of his exploration of the Belcher Islands in Hudson Bay and his traverses across Ungava Peninsula will be remembered, on "Hudson Bay and Its Natives," illustrated by motion pictures; January 6, by Dr. Charles Upson Clark, director of the School of Classical Studies of the American Academy in Rome, on "Greater Rumania"; January 20, by Professor Clarence H. Young, of Columbia University, on "Picturesque Byways of Greece." Prior to the address on December 23, the Cullum Geographical Medal of the Society was presented to Professor Henry Fairfield Osborn, president of the board of trustees of the American Museum of Natural History. An account of the presentation, as well as the text of the annual reports of the Society, read at the meeting on January 20, will be found immediately below.

Presentation of the Cullum Geographical Medal to Professor Henry Fairfield Osborn. At the monthly meeting of the American Geographical Society on December 23, at the Engineering Societies' Building, 29 West Thirty-ninth Street, the Cullum Geographical Medal of the Society was presented to Professor Henry Fairfield Osborn, the eminent paleontologist and president of the board of trustees of the American Museum of Natural History. In presenting the medal, President Greenough, who presided at the meeting, spoke as follows:

"It is my pleasing duty tonight to bestow your gold medal upon a distinguished recipient. In the past we have often given similar recognition of service rendered to geographical science but, I think, never to any one quite so intimately associated with the life and learning of this metropolis. The impress left by his endeavors upon the opportunity for knowledge in this city will endure long after all of us are gone. Let me read the inscription upon the medal:

TO
HENRY FAIRFIELD OSBORN
FOR HIS REVELATIONS
OF THE LIFE AND ART OF THE
MEN OF THE OLD STONE AGE
AND
IN RECOGNITION OF HIS SERVICE TO GEOGRAPHICAL EDUCATION
THROUGH THE AMERICAN MUSEUM OF NATURAL HISTORY
1919

"Geography claims within its province the study of man as affected by environment no less than of other forms of development of the earth's surface. Both heads of the inscription, therefore, are germane to our Society, and in the person of our guest we honor alike the author and the administrator. He has been, moreover, a leading student of the paleogeography of North America in its relations to that of Eurasia. I wish that it were possible to dwell here upon his story of the cave men, preserved and revealed by the discovery of their dwellings, decorated with surprising pictures of contemporary animal life. Suffice it to say that the narrative is enthralling and the argument is conclusive of the existence and art of a race dating back to a period so ancient that the pyramids seem only of yesterday by comparison.

"And what shall I say of the great museum of which our guest is the head and

which occupies easily the first place in the world amongst undertakings of its character? He has sent expeditions into every country and has gathered from them specimens of every form of life for the free instruction of our people. No citizen of New York can fail to thrill with pride as he views the admirable results of the administration and its unique addition to the attractions of this city, interpreting by the light of science vestiges of a remote past in which our own country is so prolific.

"And now, Sir, permit me to ask your acceptance of this memorial of the admiration and esteem of our Society, accompanied by the wish that you may long continue the valued labors which have already so notably enriched our community."

After the acceptance of the medal by Professor Osborn, Mr. Robert J. Flaherty addressed the Society on "Hudson Bay and Its Natives," as referred to above.

Annual Reports of the Society. At the annual meeting of the American Geographical Society held on January 20 at the Engineering Societies' Building, 29 West Thirty-ninth Street, the annual reports of the Council, of the Treasurer, and of the Special Committee were read, as follows:

REPORT OF THE COUNCIL

January 15, 1920

To the Fellows of the American Geographical Society:

In reviewing the past year the Society may feel satisfaction in the knowledge of substantial service rendered by it to the United States Government and of usefulness to its members, notwithstanding certain difficulties caused by labor troubles and general economic disturbances. Reference was made in the last annual report to services in connection with the so-called Inquiry, organized by the Department of State to prepare information for use by the Peace Conference. The matter assembled by the joint efforts of the agencies concerned in the Inquiry proved of the greatest use at the European conference. Our Director, Dr. Bowman, accompanied the Commission to Paris and was employed there during the first five months of the year in affairs of great consequence, and again, after his return to America in June, he was summoned abroad in September for a further service of three months. The value of the assistance rendered by the Society has been suitably acknowledged by the Department of State, and the whole episode will constitute a permanent monument in the history of the organization.

Another assignment by the Department of State, second only in importance to the service at Paris, was declared when the Society was requested to conduct an economic survey of territory in dispute between the states of Guatemala and Honduras, involving their respective boundary limits. The Secretary of State, having been asked to use his good offices in this international complication, suggested the aid of our Society as a competent and disinterested authority to conduct an economic survey for the purpose of establishing existing facts as a foundation for the desired decision. The designation of our Society in such a capacity is the only instance known to us of the use in this country of a private organization in such an international function. A suitable expedition was organized and conducted by our Society, and our report was submitted to the Department of State. Thus again is illustrated the high consideration enjoyed by our organization amongst competent authorities.

The Council holds very definite views of the scope and importance of the field occupied by the Society as affording opportunity for permanent contributions to the science of geography in a manner and to an extent not covered by any similar association in the country. In the near future the Council may present their views in a more extended statement to all of the Fellows, together with an argument and appeal to those interested.

The regularity of the publication of our various periodicals was seriously interfered with by the printing troubles in New York City, but the indulgence of our Fellows precluded complaint and publication is now approaching regularity. The disorganization and the greatly increased cost of printing has also delayed the appearance of the monographs, mentioned in the last report, but these will be put forward at the earliest practicable moment and, it is believed, will prove interesting and opportune.

The value and interest of our publications has been attested by many communications received, and their highly scientific character has been maintained. They have been as follows: the *Annals of the Association of American Geographers*, an annual publication; the *Geographical Review*, monthly; the *Journal of Geography*, monthly, except for three summer months. The circulation of each shows a marked tendency to increase, very gratifying when the rather technical character of the publications is considered.

Additions to the Library comprise 937 books, 778 pamphlets, 5,500 periodicals, 4,552 maps, and 60 atlases. Our collection now comprises 55,723 books and pamphlets, 46,205 maps, and 922 atlases.

The lectures of the Society have continued to be attended by large numbers, who find

them a source of special interest because of the variety of the topics covered and the high reputation of the lecturers. Addresses were delivered by the following: the late Mr. Theodoor de Booy, Professor Albert Bushnell Hart, Mr. Henry Woodhouse, Professor Alfred G. Mayor, Mr. Herman Montagu Donner, Professor J. Paul Goode, Mr. Jerome Davis, Mr. Frederick Webb Hodge, Mr. Frederic Dean, Miss Florence Parbury, Mr. Robert J. Flaherty.

The number of Fellows at the close of the year was 3,900, of whom 385 were Life Fellows. This shows a falling-off of only 58 in number, which, in view of the influences of the war, must be regarded as indicating a satisfactory condition.

The Society awarded the Cullum Geographical Medal in 1919 as follows:

To Emmanuel de Margerie, director of the Geological Survey of Alsace and Lorraine, for his distinguished work on "La Face de la Terre" and for his contributions to geographical science;

And to Henry Fairfield Osborn, president of the American Museum of Natural History, for his work on the life and art of the Men of the Old Stone Age and in recognition of his service to geographical education through the American Museum of Natural History.

The Society joined with similar organizations at the time of the Roosevelt exercises in the city in exhibiting a collection of maps and souvenirs associated with Colonel Roosevelt's work as an explorer.

The report of the Treasurer submitted herewith gives a summary of the income and expenses of the Society, together with a condensed balance sheet which shows a satisfactory financial position, notwithstanding the difficulties of the time.

The creditable work which has been done during the year is largely attributable to the earnestness and efficiency of the staff, which deserves cordial recognition, in addition to such moderate increases in compensation as the finances of the institution have rendered possible.

Respectfully submitted on behalf of the Council.

John Greenough
Chairman

Report of the Treasurer for 1919

The following is a statement of the receipts and expenses and the condensed balance sheet of the Society as shown by the books on December 31, 1919:

Receipts and Expenses

On December 31, 1918, there was at balance of income account	$1,322.17
During the year there has been received from annual dues, interest on investments, and sales of publications	57,324.82
	$58,646.99
There has been expended for salaries, house expenses, library, meetings, publications, postage, insurance, etc	$56,269.85
Balance of income account December 31, 1919	$2,377.14

Condensed Balance Sheet

Cash	$47,077.62	Sundry deposits	$49,427.66
Cash, special deposit	6,963.11	Annual dues paid in advance	1,070.00
		Income account balance	2,377.14
		Balance of capital account uninvested	1,165.93
	$54,040.73		$54,040.73

Henry Parish
Treasurer

Report of the Special Committee

January 15, 1920

The Special Committee appointed December 18, 1919, to nominate and invite suitable persons to fill vacancies which will occur in the offices of the Society at the date of its annual meeting in January, 1920, respectfully report that they recommend the election of the following gentlemen to the offices designated:

		TERM TO EXPIRE IN
President	John Greenough	1921
Vice-President	Philip W. Henry	1923
Domestic Corresponding Secretary	W. Redmond Cross	1923
Treasurer	Henry Parish	1921
Councilors	Madison Grant, Grenville Kane, Allison V. Armour, Alexander Hamilton Rice	1923

Paul Tuckerman, Walter B. James, James B. Ford — *Committee*

The reports of the Council and the Treasurer were approved and ordered on file. The persons recommended by the Special Committee for the offices to be filled received the unanimous vote of the Society and were declared duly elected.

NORTH AMERICA

Snow and the Railroads. The occasional heavy winter snows of the northeastern sections of the United States not infrequently cause temporary obstruction and delay of railroad transportation, with resulting inconvenience and often considerable pecuniary loss. Various methods of meeting these difficulties are adopted, such as snow fences, windbreaks formed of growing trees, etc. In many portions of the mountain area of the West, heavy winter snowfalls are the rule, and the railroad companies are forced to adopt elaborate and expensive methods to enable them to keep their trains running.

Andrew H. Palmer, of the U. S. Weather Bureau at San Francisco, Cal., has recently brought together some interesting illustrations of the effects of snow upon railway transportation (*Monthly Weather Rev.*, Oct., 1919, pp. 698-699). The chief difficulties are encountered in the region of the heavy snows of the Cascade Range and the Sierra Nevada. In the case of snows a few feet in depth on level ground locomotive push plows or rotary plows are employed. Where the snows accumulate to depths of 25 to 30 feet, or perhaps twice that depth in canyons, any such methods of removal are out of the question. Therefore the Southern Pacific Railroad (Overland Route) constructed its famous "thirty miles of snow sheds" over part of its tracks across the Sierra Nevada between Blue Canyon and Truckee. These cost $42,000 a mile over single track and $65,000 a mile over double track. In 1914, a typical year, $65,000 were spent for repairs and $91,000 for renewals. The average life of a snow shed is 22 years. These sheds are designed to sustain snow 16 feet deep. When the depths are greater, the snow must be shoveled off by hand.

There is naturally great danger of fire in the sheds. In summer four trains and in winter two trains are kept under constant steam for fire-fighting use. Further, all local engines carry pumps and are followed by tank cars filled with water to be used in case of fire. Concrete snow sheds have been built in some cases. On January 22, 1916, a snow slide near Corea, Wash., cut an all-steel passenger train in two, swept several coaches into a ravine, and caused the loss of several lives. Mr. Palmer's paper is illustrated by several views of the heavy snowfalls of the Sierra Nevada in relation to railroad operation.

R. DEC. WARD

A New Series of Rainfall Maps for the United States. An unusually important discussion of certain aspects of the rainfall of the United States is that by Joseph Burton Kincer, of the U. S. Weather Bureau, on "The Seasonal Distribution of Precipitation and Its Frequency and Intensity in the United States" (*Monthly Weather Rev.*, Sept., 1919, pp. 624-631, with 16 maps in 1:12,200,000). This article is accompanied by a new series of monthly and seasonal rainfall maps for the United States, which are now the "standard" maps, superseding all those previously published. The earlier monthly and seasonal rainfall maps were based on data from a limited number of stations, covering various years, not reduced to the same period, and had their isohyets drawn with little regard to topography. In Mr. Kincer's new maps the records have all been reduced to a uniform period of twenty years (1895 to 1914 inclusive). About 1,600 stations had actual averages for the period in question, with short breaks interpolated, and 2,000 other records were reduced to this uniform period. The isohyets were then drawn on hachured base maps with reasonable regard to topographic controls. In addition to these monthly and seasonal rainfall maps there are new maps showing the percentages of the annual amount of rain which occurs in the four seasons; the average annual numbers of days with precipitation of 0.01-0.25 inch, 0.26-1.00 inch, and over

2.00 inches; the average annual number of days with precipitation more than 1.00 inch in an hour; maximum precipitation in 24 hours; greatest number of consecutive days without 0.25 inch of rainfall from March 1 to September 30 (1895-1914); percentage of years with 30 consecutive days or more without 0.25 inch of rainfall in 24 hours from March 1 to September 30 (1895-1914). There are also graphs indicating for selected stations the variations, from year to year, in the annual, seasonal, and monthly totals.

Mr. Kincer distinguishes three major types of seasonal distribution of precipitation (see, in connection with this, R. DeC. Ward: Rainfall Types of the United States, *Geogr. Rev.*, Vol. 4, 1917, pp. 131-144). These are the Pacific type, which has a marked winter maximum; the Plains type, with relatively heavy rainfall in the late spring and early summer, and the Eastern type, with a comparatively uniform distribution through the year. These three are the most important types, "considering the areas covered and their climatic importance."

The new rainfall maps contained in Mr. Kincer's paper will also be included in the forthcoming rainfall section of the "Atlas of American Agriculture." A detailed note on these maps will be printed in the *Geographical Review* as soon as possible after the publication of that section. R. DEC. WARD

AFRICA

Projected Railways Across the Sahara. The opening-up of vast undeveloped regions by railways is one of the most daring and successful operations of this generation, and the French have for many years dreamed of thus uniting their colonies in North Africa. Hitherto the most prominent names in this connection have been those of Bertolet and Souleyre. M. Bertolet suggested an extensive system comprising an Algiers-Cape trunk line and branches connecting Senegal, Lake Chad, and Nigeria. M. Souleyre's plan, on the other hand, confined itself to a trunk line across the Sahara, with branches linking it to Lake Chad and Nigeria.

A new contribution to Trans-Saharan schemes, by Lieutenant-Colonel Godefroy, has just appeared under the title "Transsahariens et Transafricains," (89 pp., with map, 1:8,000,000, Laroze, Paris, 1919). This treatise brings a new light to bear upon the subject, for, while other plans have considered the Sahara as merely an unproductive waste, Colonel Godefroy considers that there are great possibilities of agricultural development in the desert itself, provided that the right route for crossing it be chosen. The route suggested would follow the historic caravan route which links up a line of oases, each the center of an extensive stretch of pasture land. The northern starting point would be the present terminus of the railway of which Colonel Godefroy is the director, the line which runs southward into the desert from Biskra to Tuggurt and northward towards Algiers. The projected line would run in a southwesterly direction through Wargla to Inifel and on to In Salah, there turning directly to the south and running to Buressa, whence it would join the Niger at Tosaye. The prospects of development in French Nigeria are painted as brightly as those of the Sahara, Colonel Godefroy asserting that, with the same system of controlling the floods as is used in Egypt, the region would become as fertile. If the Sahara should prove to be a second Argentina and Nigeria a second Egypt, the success of this part of the projected system should be assured.

The Trans-Saharan railway is, however, only a part of the whole scheme advanced by Colonel Godefroy. Two other trunk lines are also contemplated. One of these—an Algiers-Cairo line—is already more than half completed. Its purpose is to make use of the Cape-to-Cairo railway, as well as to provide for traffic along the southern littoral of the Mediterranean. The other trunk line would run along the western coast, connecting Dakar with Tangier. Since Dakar is only three days' voyage from Rio and Tangier is hoping to be connected with Europe by a tunnel, this would provide a short route to the New World. Again Colonel Godefroy is optimistic as to the possibility of agricultural development in the coastal region, which is less arid than the interior.

The plan is interesting, and, coming from the director of the Biskra-Tuggurt line, it commands attention. However, on reading the part about the possibility of development of the desert one feels constantly the tone of special pleading. For example the excessive insolation is reckoned as a valuable asset though no way has yet been found of utilizing the energy. In the same way the treatment of the chapter dealing with the difficulties of construction seems unduly optimistic. The question of labor, for example, is brushed lightly aside—the French army can provide that without difficulty.

Compared with former schemes, however, Colonel Godefroy's plan seems more practicable. There can be no question as to the advisability of the northern coast route nor of the future development of the upper Niger should a route be provided for its products.

E. M. SANDERS

ASIA

Two Interesting Maps of Syria. One of the most interesting "documents" at the peace conference at Paris was in the form of a woven rug presented by the women of the Moslem Trade School at Beirut. It was made in the form of a map, and showed the area claimed by Syrian nationalists for a united Syria. This recalls to mind a wonderful mosaic on the floor of a church at Madeba, Moab, on the plateau east of the Dead Sea. At our request Dr. Ellsworth Huntington has given us the following note on the subject (cf. also Palmer and Guthe: Die Mosaikkarte von Madeba, 10 colored plates, Leipzig, 1906, and Dr. Huntington's "Palestine and Its Transformation," Boston, 1911, pp. 204-207).

It is the oldest existing map of the region. Even today, though much of the map has been picked to pieces, one can still see palm trees by the warm Dead Sea and fish swimming in the Jordan River. Formerly the map extended from Damascus in the other direction. Fortunately the central parts around Jerusalem are still intact. As in many ancient maps the top is at the east.

For the geographer it would be hard to find anything more fascinating than this crude, yet rather effective ancient map. Perhaps some day the Syrians, with their art of putting maps on the floor, will not merely make one for the floor of some great church, but for the floor of some great schoolroom. A map on the floor seems strange to us, but to the Syrian it is perfectly natural, since he takes off his shoes and goes around in stocking feet. He sits on one side, and the map is spread out before him. For the children who sat in the old church at Madeba it must have been an interesting sight when they had tired of the service to see the lions chasing the gorillas among the palm trees of Palestine on the floor before them.

Wasteful Exploitation of Manchurian Forests. No country has suffered more heavily than China as a result of reckless destruction of her forests, yet deforestation continues in the Manchurian provinces. Much of Manchuria, lying as it does in the great wheat belt of the world, is, of course, land properly devoted to agriculture. With the building of the Chinese Eastern Railway clearing and cultivation have gone on apace. Harbin, little more than twenty years ago a hamlet of fishermen, is now a town of 100,000 and a great wheat mart. The western section of the province of Kirin and the valleys of the large rivers are under cultivation, and settlers are pushing forward. Yet vast areas in Kirin province and also north of the Sungari are natural forest reserves, and it is against the wasteful exploitation of these areas that a protest has been recently put forward by Captain Arthur de C. Sowerby, who has made several journeys of exploration in these little-known sections of Manchuria (The Exploration of Manchuria, *Geogr. Journ.*, August, 1919).

The great Kirin forest covers the Chang Pei range and extends northwards, touching the banks of the Sungari east of Harbin and stretching well into the angle formed by the junction of the Ussuri and the Amur. The area of the forest is said to be equal to that of Scotland. The splendid forests of the Chang Pei Shan, chiefly deciduous, with the oak as the predominant tree, are being cut on the southern side by Japanese, who get the timber out by way of the Yalu, and on the northern side by Chinese, who make use of the Sungari and its tributaries. Still farther north Russian and Chinese companies extract timber consisting chiefly of pine. Enormous quantities of oak, walnut, and maple are cut for fuel for the populace and for locomotives and steamers on the Sungari. From his camp on the Sungari Captain Sowerby had opportunity of gaging the extensive output of timber from the slopes at the sources of the main stream and its tributaries. "Every hour of the day dozens of huge rafts of logs came floating past. Some of these contained twenty or thirty thousand feet of timber, averaging 3 to 4 feet in diameter, sometimes much more."

GEOGRAPHICAL NEWS

Obituary

Francisco P. Moreno, the foremost Argentine geographer, died at Buenos Aires on November 22, at the age of 67. In the words of Bailey Willis' excellent biography of Moreno in the "Geographen-Kalender" (Perthes, Gotha) for 1911, to which the reader is referred for fuller information, "among the chief results of his career . . . . there stand out conspicuously the exploration of Patagonia, the organization of the Museo de La Plata and of the researches conducted under its auspices, the conclusion of the Argentino-Chilean boundary arbitration according to a satisfactory division of the territory in dispute, and the institution of topographical surveys of the Province of Buenos Aires." In 1909 Señor Moreno was awarded the Cullum Geographical Medal of the American Geographical Society.

GEOGRAPHICAL REVIEWS

Beginning with this number the minor bibliographical entries will be omitted from the department heretofore known as "Geographical Publications", and only reviews will be published under the correspondingly changed heading of "Geographical Reviews." The omitted entries, with references to the reviews here published, will be gathered together and issued as an annual volume which will record the geographical publications that have come to the Society's notice during the year. This annual bibliography will be sent free to all institutions or individuals exchanging publications with the Society or subscribing to the Review *and, on request, to Fellows who may desire it. The first issue, it is expected, will appear early in 1921.*

Our Immigration Problem

J. W. Jenks and W. J. Lauck. **The Immigration Problem: A Study of American Immigration Conditions and Needs.** 4th edit., revised and enlarged. xxv and 605 pp.; map, diagrs., bibliogr., index. Funk & Wagnalls Co., New York and London, 1917. $1.75. 8 x 5½ inches.

The value of this book is attested by its appearing in a fourth edition. It stands alone in the field of immigration literature, being the only comprehensive and authoritative presentation of the findings of the United States Immigration Commission in condensed and accessible form.

The Immigration Commission came into being through a peculiar freak of legislation. During the summer of 1906 the House was debating an immigration bill which contained as one of its major features a provision for the imposition of a reading test on would-be immigrants. This proposed measure had been before Congress pretty continuously for fifteen years or so, and, while for most of that period the preponderance of sentiment in both houses had been decidedly in its favor, yet through the various exigencies of Federal legislation it had never become law. At the date mentioned there was no question that ample majorities of Senate and House were in favor of the literacy test. Speaker Cannon, however, was vehemently opposed to it and by tactics more vigorous than parliamentary placed obstacle after obstacle in its way. Finally, on June 25, Mr. Grosvenor of Ohio proposed an amendment which struck out the entire section providing for a literacy test and in its place substituted a section creating an Immigration Commission. In this form the bill passed, and early the following year the Commission was appointed by President Roosevelt.

This piece of political legerdemain was by no means unfortunate. In the first place, the Immigration Commission proved to be one of the most scholarly and useful commissions Congress had ever created. In the second place, with delightful irony, one of its major recommendations was that a literacy test be imposed, and it was largely upon this recommendation that the test became law ten years later.

The Immigration Commission was composed of three Senators, three Representatives, and three civilians, and its total working staff considerably exceeded one hundred. It spent nearly three years in its investigation, when its career was abruptly terminated by the refusal of Congress to make any further appropriations for it. Here again the result was not unfortunate. A very thorough and sweeping research had been made, covering not only this country but the European sources of immigration; but the material had not been thoroughly digested by the Commission, nor had conclusions been worked out in detail and completeness. As a consequence the published report consists almost entirely of facts and figures, with very little space devoted to the statement of the Commission's own conclusions and recommendations. Students of the subject, therefore, are forced to go to the original data in support of their arguments, which is much better than quoting the opinions of an official body, however trustworthy.

The report of the Commission comprises forty volumes. It was very difficult to secure the work at the time of its publication, and it is practically unobtainable now. Only the best equipped even of our large libraries possess it. It is accordingly very important that a trustworthy digest should be available. Professor Jenks and Mr. Lauck are particularly well fitted to supply such a need, the former having been a member of the Commission and the latter one of its important experts. The authors describe themselves as "not advocates, but interpreters of facts." It need hardly be added that in their discussions they have not confined themselves absolutely to the data contained in the report of the Commission.

In the present edition the discussions have been brought up to date, particularly by the inclusion of a chapter on the immigration law of 1917 prepared by Mr. W. W. Husband, the full text of this bill, a presentation of the plan proposed by Dr. Sidney L. Gulick, a brief bibliography, and numerous additional diagrams and figures.

HENRY P. FAIRCHILD

J. F. STEINER. **The Japanese Invasion: A Study in the Psychology of Inter-Racial Contacts.** With an introduction by R. E. Park. xvii and 231 pp.; bibliogr., index. A. C. McClurg & Co., Chicago, 1917. $1.25. 7½ x 5 inches.

This little volume may be heartily commended to those who desire to understand the problem of Japanese immigration into the United States. The importance of that problem does not appear to be realized in some parts of our country; its complicated character is still less appreciated.

Dr. Steiner was for some years a resident of Japan, as a teacher in a mission college at Sendai, and was able to study the economic and social conditions there at first hand. Japanese sentiment therefore is treated sympathetically and fairly, and this gives added weight to the conclusion at which the author arrives.

There are four angles from which the problem must be approached—the economic, the racial, the social, and the political. There is a tendency in the United States to treat it as though it were essentially, if not wholly, an economic one. The economic phase is indeed a very important one. Overpopulated Japan with low wages and low standards of living for her laborers thrusts a portion of them out to seek for new homes in other lands where better conditions prevail. The most attractive conditions are found in Australia, South America, Canada, and the United States; but upon reaching these countries the Japanese meet with the opposition of the labor unions. This opposition, which is based upon economic grounds, is strongly re-enforced, as Dr. Steiner points out, by the racial prejudice which springs up quite naturally when such dissimilar types as the Japanese and the white man are brought into contact. The author calls attention, too, to a fact often overlooked, that this prejudice exists in the Japanese as well as in the American.

Dr. Steiner reminds us that "during the negotiations at Washington in 1913 between Viscount Chinda and the Federal Government concerning the California alien land law, the Japanese ambassador was given repeated assurances by both the President and the Secretary of State that the enactment was based on purely economic considerations and was not the outcome of racial prejudice." Dr. Steiner does not believe that such declarations convince anybody, least of all the Japanese, that race prejudice "has played such an insignificant part in the American-Japanese problem." In another paragraph he says: "Nothing is gained by ignoring the racial aspects of the question as is now the tendency in some quarters." In this statement we believe he is quite correct.

Among the more intelligent classes in both countries, it is true, there is but little of race prejudice. Many persons seem to be entirely free from it. Both governments have striven consistently to maintain the traditional friendship; the merchants, too, of both countries seek to remove this prejudice. It is, however, an unreasoning sentiment that springs too naturally to be easily eradicated from the mind of the ordinary man.

Dr. Steiner quotes from two well-known friends of the Japanese to show how real this prejudice is on the part of the Japanese. From Professor Ladd is the following: "Among the people of all classes, uninformed, unreasoning feeling towards all foreigners still underlies the crust of enforced or selfish and conventional politeness." From Dr. Gulick is this: "Few foreigners have received a hearty welcome from the people at large. They are suspected and hated; as little room as possible is made for them. The less of their presence and advice the better."

Professor Ladd's statement was written in 1895, that of Dr. Gulick in 1905. Dr. Steiner says: "That these statements are even today not wide of the mark can be verified by anyone who has an intimate knowledge of the life of the Japanese people."

This prejudice on the part of both peoples is shown clearly in their attitude towards inter-racial marriage, decidedly frowned upon by both. The American wife of a Japanese husband and the Japanese wife of an American husband both suffer from social ostracism. The few exceptions serve to emphasize the rule, and the unfortunate Eurasian child is disliked in Japan both by Japanese and by Europeans.

Thus social problems also arise out of the immigration problem. But that of inter-racial marriage is not the only one. Neither is it the principal one. When the Japanese immigrant meets with a chilly reception in the United States, he is driven by this prejudice to limit his social intercourse as far as possible to his fellow countrymen. Thus in California the Japanese farmers, gardeners, and laborers tend to segregate themselves and form separate communities. This is inimical to the social healthfulness of the state. These immigrants thus living apart make little or no progress in knowledge of the language, customs, and ideals of their American neighbors. They establish schools

where instruction is given in the Japanese language, and loyalty is inculcated not to the state in which they reside but to the mikado over the sea. The nineteen Buddhist temples which they support in California still further strengthen the ties with the homeland and widen the breach between them and the people among whom they dwell.

From this condition of affairs there arises a political problem with which Dr. Steiner does not deal. The American-born children of Japanese parents are, according to American law, citizens of the United States; but in Japanese law they are subjects of the mikado and as loyal subjects must go home for military instruction, which many of them do when they arrive at the proper age. Growing up in such an environment as has just been described and trained to love supremely and to defend the island empire in the Orient, how can it be expected that they will make good citizens of the United States? Under a more hospitable reception the results would no doubt be quite different. It must be remembered, however, that the masses of the Japanese immigrants in California are not of the cultured classes but come from the rural districts, where ignorance and conservatism prevail.

What is the solution of the problem thus outlined? Dr. Steiner reviews the measures taken by the governments and proposed by others but does not find them satisfactory. It is not so clearly understood as it should be that there is no convention absolutely excluding Japanese laborers from the United States. The "gentleman's agreement" is an informal arrangement, in which Japan undertakes not to issue to laborers, with certain exceptions, passports for the United States.

Among those who have already come in large numbers into this country are farmers and gardeners. That they are skillful, industrious, and law-abiding none can deny, but this does not make them welcome to those who must compete with them and who are unwilling to toil as unceasingly as the Japanese laborer, deprive themselves as he does of recreation, or adopt his standard of comfort.

Of Dr. Gulick's proposal that a general immigration law be enacted limiting the incoming of immigrants from any country to a certain per cent, say 5 per cent, of the number of native-born of the first generation, together with the number of naturalized citizens of that race in the United States at the time of the national census next preceding, Dr. Steiner says: "While such a law theoretically seems adapted to meet the present situation, it is such a radical departure from our traditional policy concerning European immigration that it is doubtful if in the near future it would receive the support of the American public." Dr. Steiner does not think that it would please the Japanese either, "who, to all practical intents and purposes, even if not theoretically, would be discriminated against."

In Dr. Steiner's opinion the first step to be taken towards a solution of the problem is to recognize frankly the racial factors involved. The next is to induce the Japanese to "see the wisdom of permitting only the best representatives of their race to come to America." This will enable the peoples of the two countries to meet under circumstances "the most favorable for a mutual appreciation of each other's character." Mutual patience and forbearance are necessary, and the problem "must be worked out by a gradual process which it may take generations to complete."

"Nothing," the author says, "is more fraught with peril than the continuance of our present half-hearted and irresolute policy toward the Far East."

E. T. WILLIAMS

PHYSICAL GEOGRAPHY OF NORTHWESTERN AMAZON BASIN

P. P. BAUER. **NW-Amazonien: Ein Beitrag zur Geographie Äquatorial-Amerikas.** xiv and 107 pp.; map, diagrs., ills., bibliogr. Rudolf M. Rohrer, Brünn, 1919. 9 x 6 inches.

Dr. Bauer, Moravian by birth, was a member of Dr. Hamilton Rice's expedition of 1912-13 to the region between the branches of the Amazon and the Orinoco and gave special attention to geology and topography. His present report opens with a bibliography of the region, which is followed by a 20-page review of previous explorations and a 10-page summary of relations to the rest of South America. Then come 30 pages on structure and form of northwestern Amazonia, 14 on its hydrography, and 25 on its climate. The region thus treated lies chiefly between the equator and latitude 4° N., or between the Yapura branch of the Amazon and the Guaviare branch of the Orinoco; it stretches about 350 miles eastward from the folded and deeply dissected ranges of the Andes to the tableland of Guiana, which is formed of from 600 to 1,500 meters of horizontal sandstones lying on a relatively even foundation of crystalline rocks.

The piedmont belt in the west, occupied by heavy deposits of coarse detritus actively outwashed from the mountains, is followed by gently east-sloping upland plains, known as the Mesas of Pardaos and of Iguaje, seldom over 500 meters in altitude, composed of heavy pervious sandstones mostly without tree growth in spite of abundant rainfall.

Here the main Andean river courses, narrowed and broken by rapids and bordered by belts of forest, are incised beneath the uplands, which break off 70 or 80 miles from the Andes in a bold escarpment, irregularly lobate in plan, fronted by isolated sandstone outliers and dwindling hills of the underlying impervious beds, all heavily tree-covered. Thus descent is made to a forested plain in which the main rivers, as well as many others which are fed by copious springs that issue from the impervious beds at the base of the sandstone escarpment, wander freely eastward in split or meandering channels without rapids. The plain is, however, followed by a second upland, the Mesa of Yambi, which is described as composed of the same heavy pervious sandstones as those of the Mesa of Pardaos and as presenting an escarpment to the west as well as to the east. It is only after passing the second mesa, in which the rivers are again broken by rapids, that at a distance of 140 miles from the Andes the vast east-stretching area of crystalline rocks is entered upon; for the first 60 miles it is a peneplain of gneiss at an altitude of about 200 meters, but farther on it is much interrupted by granitic monadnocks, often bare, rising from 100 to 900 meters, as Wallace long ago reported. It is in this region, which extends for 150 miles or more to the sandstone tableland of Guiana, that the Cassiquiare connects the Orinoco with the Negro-Amazon. Bauer ascribes the bifurcation to a capture of Orinoco waters by a tributary of the Negro, because he finds the fall of the latter to be steeper than that of the former; but, until the topographic details of a very recently formed elbow of capture are found, the case can hardly be considered proved.

The several chapters of which the foregoing physiographic summary is an abstract, are less easily understood than could be wished; partly because the simple forms of the region are treated with unnecessary, even laborious elaboration, partly because the generalizations as to topography are complicated by discussions of the misunderstandings of earlier explorers, and still more because the text is not sufficiently illuminated with diagrams. It is especially for the latter reason that the relation of the Mesa of Yambi to the Mesa of Pardaos is not clear. A greater importance is attached to the warm and wet climate in the sculpturing of the region than seems warranted, for very similar landforms are found in other regions of similar structure but different climate.

W. M. DAVIS

A SCIENTIFIC GUIDEBOOK

W. M. DAVIS. **A Handbook of Northern France.** xi and 174 pp.; maps, diagrs., index. Harvard University Press, Cambridge, Mass., 1918. $1.00. 6½ x 4½ inches.

The unusual success of this little book, which was used by thousands of officers in France, is truly merited. It supplies material (which can be found in no other English book) on those broad features of the geography of northern France that every person interested in the larger operations and relations of the war finds indispensable. Professor Davis has selected the outstanding features of geology, topography, drainage, coal basins, railroads, etc., and has placed them upon original sketches, block diagrams, etc., in such a way as to give a vivid picture and explanation of the country. It is not a book useful merely in time of war; it is an admirable guidebook for the thoughtful traveler. The graphic quality of Professor Davis' drawings was never put to a more useful purpose. The small pocket size enables one to carry it conveniently.

FRENCH DEVELOPMENT OF MOROCCO

COMTE DE LA REVELIÈRE. **Les énergies françaises au Maroc: Études économiques et sociales.** 2nd edit. xiv and 561 pp.; maps, ill., index. Plon-Nourrit & Cie., Paris, 1917. 12 frs. 50. 10 x 6½ inches.

The book shows what Morocco, now a protectorate of France, bids fair to become under the policy that France has been pursuing since 1911. Morocco includes two great areas that are very dissimilar. The regions seaward of the Atlas Mountains have an adequate amount of rain, and winds from the Atlantic cool the air so that the climate is temperate and healthful and productive of abundant verdure. These regions have the further advantage of good soil, so that a vast area is well adapted both for grazing and cultivation.

On the other hand, the regions inland from the Atlas are nearly rainless—a brown and arid expanse, torrid in temperature a part of the year and blistered by hot winds from the Sahara. The French, naturally, are confining their attention to the more promising part of the country (see map in *Geogr. Rev.*, Vol. 8, p. 57).

The result is that knowledge of the land has been largely advanced, and most of the people, finding that the foreign régime is protecting their lives and property, are cheerfully accepting it. Ten years ago two-thirds of the population were unfriendly to all whites. Travelers, as a rule, had to take circuitous routes to reach their destination. The telegraph and telephone were not known except in a few coast towns. Morocco was

one of the least known and darkest parts of Africa though nearer to Europe than any other African land. All this is being changed under French rule. Wireless telegraphy connects all parts of the country, and over 8,000 miles of telegraph wire has been strung. Agricultural, horticultural, arboricultural, veterinary, and meteorological services have been established, and agricultural fairs are held. Some railroads also are building.

The French have, thus far, extended their influence chiefly in the Atlantic and Mediterranean ports and their wide hinterland, covering about half of the best part of the country.

At the head of the whole project stands General Lyautey, Resident General, a man of great tact and resource, under whose direction all phases of the work have gone steadily forward.

The book contains a store of information on topics relating to the protectorate, the excellent relations between the French and the natives, property and the methods of transferring it, principal towns and ports, river navigation, highways, agriculture, forests, industries, commerce, and finances. All the information on physical features and climate is to be found in the chapter headed "Agriculture." These natural factors, on which development so largely depends, are scantily treated; but the outlines of topography and weather and their effects upon the people and their enterprises are briefly noted.

The population of the entire French zone is estimated at 5,400,000. Most of Morocco is under French control; but Tangier, the leading port, is under international management, and a comparatively small area, partly in the north (the Rif) and partly in the extreme south (Rio de Oro), is governed by Spain.

France is improving Moroccan methods of tillage. The book shows that good plowing is beginning to supplant skin-deep cultivation. The scythe and harvesting machinery are coming in. Intensive cultivation will be the rule. The government intends to give the poorer people a chance to acquire small holdings so that they may support their families on their own plots of ground. Forestry methods will be introduced to provide future wood crops; and all the domestic animal industries will be encouraged, for they have large possibilities. Morocco is thus making progress in many ways.

For an article on the same topic as this book see A. de Tarde: The Work of France in Morocco, in the *Review*, Vol. 8, 1919, pp. 1-30. CYRUS C. ADAMS

THE FUTURE OF INDIA

WILLIAM ARCHER. **India and the Future.** 326 pp.; ills., index. Alfred A. Knopf, New York, 1918. $3.00. 9½ x 6 inches.

Mr. Archer has given to the public a new outlook of the Indian people and their progress. The entire theme of the story is based on the faith that a rational movement towards nationalism exists and that a stable world order is attainable. India is taken as a test case. If the people living south of the Himalayas can be emancipated from superstition and can take their place among the nations of the earth, then, the author believes, the problems of race and nationality which are being thrust upon the world today are capable of a solution which will be just and final. If, on the other hand, a weak nation (India) is always to be encroached upon by a strong nation (England) then any attempt to seek a solution to international problems is almost futile. In trying out the test case many sides of the Indian people are considered: its capabilities for being a united nation; its possibilities of rising above its religion; the success of any social reform movement to free the land from caste and its subsidiary evils; the use of the present Indian opposition to foreign rule; and the tendency of India's art, culture, and religion. In the discussion a splendid balance is attained. Praise and appreciation are mingled with just censure. The real achievements of India excite the author's ardent admiration, but the "multitudinous nightmares of its indigenous cults" are displayed in all their rawness. In the final analysis, however, Mr. Archer is looking forward to the end of British rule in India, the beginning of which was "the most heroic adventure in history." He takes the stand that English rule is a means, not an end; that it is not good in itself but is infinitely better than things as they were; and that, while the time has not yet come when this overlordship can be terminated, the face of the Indian service should be turned definitely towards educating the Hindu to assume the responsibilities of national life. ROBERT M. BROWN

THE WORLD'S FOOD SUPPLY

V. C. FINCH AND O. E. BAKER. **Geography of the World's Agriculture.** 149 pp.; maps, diagrs., bibliogr., indexes. Office of Farm Management, U. S. Dept. of Agriculture, Washington, D. C., 1917. 10½ x 13 inches.

In the words of the authors, "the purpose of this study is to show the geographic origin of the world's supply of food and of other important agricultural products and

to indicate briefly the climatic, soil, and economic conditions that account for the distribution of the crops and live stock of the world.'' The authors' efforts have culminated in an atlas of great merit. Although as an atlas showing production it is not original in its conception, yet it stands out as a distinctive contribution for both the professional geographer and the practical layman.

The maps with the exception of the first two, which are in colors, are all printed in black and white. The colored maps show land relief and precipitation, respectively, for the entire earth (Mercator projection). The former is based upon ''Physical Maps of the Continents'' by J. Paul Goode (Chicago, 1913-15) and the latter upon ''Oxford Wall Maps of the Continent'' by A. J. Herbertson (1908-11) ''except the United States, which is based on data supplied by U. S. Weather Bureau.'' In the compilation of the black-and-white maps the authors have had the valuable assistance of many government specialists. Mr. Finch prepared the part relating to foreign countries while Mr. Baker prepared the sections relating to the United States.

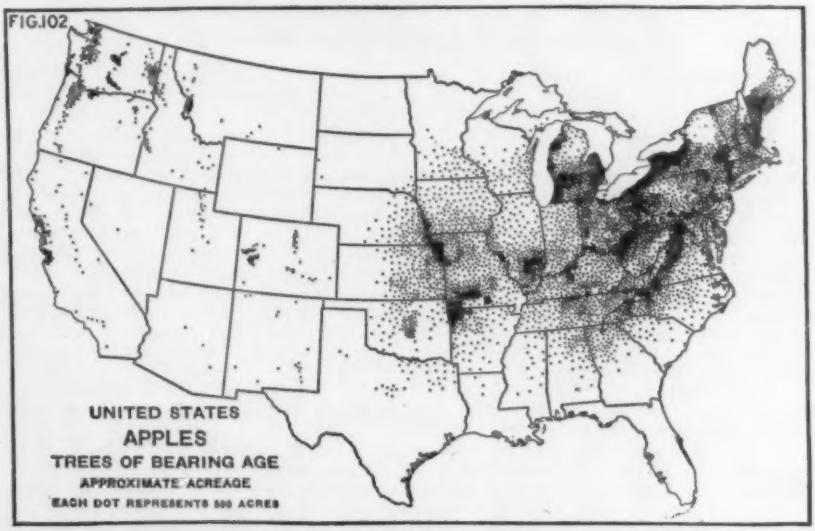

FIG. 1—Reproduction of a figure from Finch and Baker's "Geography of the World's Agriculture" to illustrate the dot method of distribution representation employed in that work.

The base maps are all in outline. On the Mercator maps are shown country boundaries, the states of the United States, and the provinces of Canada—all without names. In the case of individual countries, counties or their equivalent are drawn where the map is sufficiently large (nearly a full page) to allow of such detail. An identification map of the world gives the names of all countries and in the case of the United States and Canada the names of states and provinces respectively. Similar identification maps for the United States, Europe, Canada, India, and Argentina are given separately and on a larger scale. By reference to these maps the names of political divisions can easily be determined on the production maps.

The dot method is employed for showing distribution. By letting one dot represent a unit quantity and distributing the dots with reference to place of production, the authors have succeeded in presenting a kind of shade effect which portrays at once the relative intensity of production. Figure 102 on page 80, showing ''Trees of Bearing Age'' for apples, is reproduced here to illustrate the effectiveness of this cartographic scheme. This method serves further to displace generalizations and to give accuracy.

In each instance distribution is shown by areal values, excepting rice, cotton, tobacco, sugar, and coffee, for which dots represent actual production. Accompanying the areal maps are graphs of total production, so that, by combining the area represented by dots with the total production shown by the graph, one can ascertain very closely the density of production.

These maps help one visualize, as no other method can, the distribution and produc-

tion of the earth's vital agricultural products. It is unfortunate, however, that the authors should have failed to show parallels and meridians. That their significance is recognized is attested by the wheat map for Europe (p. 21), where the 50th parallel is indicated as the northern limit of wheat, and the sugar map of the world (p. 73), where the dividing line between the growing areas of beet and cane sugar is drawn. An indication of the latitude and longitude on the margins of the maps would have avoided marring their legibility and yet would have afforded some clue as to location and latitudinal climatic effects.

The treatment as a whole is by products rather than by countries. Among the points developed in most of the discussions are the place of origin of the product, the conditions under which it prospers with reference both to nature's controls and the influence of markets, and its practical value, including its relation to population. Statistical tables accompany the descriptive matter occasionally, and also special small maps to illustrate some phase of the subject deserving emphasis. Inset maps or diagrams as parts of the larger maps further illuminate the atlas. EUGENE VAN CLEEF

ARISTOTLE'S TREATISE ON METEOROLOGY

—— **Aristotelis meteorologicorum libri quattuor.** Recensuit, indicem verborum addidit F. H. Fobes. xlviii and 236 pp.; index. Harvard University, Cambridge, Mass., 1919. 9 x 6 inches.

Aristotle's treatise on meteorology is one of the great milestones in the development of the science of the earth's atmosphere. It remained for nearly two thousand years the standard text, and all the textbooks which were issued in Europe till the end of the seventeenth century were based exclusively upon it. Viewed in the light of the modern developments of meteorology, Aristotle's treatise is today inevitably very antiquated; but the important part it played throughout many centuries, as a guide, an inspiration, and a systematic presentation of important facts, entitles it, even now, to more than passing mention. In his epoch-making "Lehrbuch der Meteorologie," Schmid well said of Aristotle, "unverkennbar hat bereits der grosse Gelehrte des Alterthums, hat Aristoteles tiefahnend einige wichtige Momente, die jetzt erst zu ihrer Geltung gekommen sind, ergriffen; allein seine Schüler, Commentatoren und Nachfolger, unter den Griechen Theophrast, unter den Römern Plinius und Seneca, haben diese Anfänge nicht wesentlich entwickelt und erweitert" (p. 3).

Aristotle's work has been translated into French, English, and Italian, the only fairly recent translation being that in French (1863). A new English translation was promised by the Clarendon Press before the war.

Professor Fobes's new text of the four books of Aristotle's "Meteorology" is a scholarly piece of work, obviously first of all of very distinct importance to students of the classics, but of more than passing interest to students of meteorology. The Greek text of the four books of the "Meteorology," with the footnotes, occupies about 160 pages; somewhat over 100 pages are devoted to the preface, bibliographies, and index—all of which are in Latin. The publication of this volume inevitably leads to the expression of the hope that a new English translation of Aristotle's classic may not long be delayed. R. DEC. WARD

Note

With regard to the sentence "In quality of execution the maps are scarcely creditable to the India Survey," in the brief comment on Sheets 78 G, H, and J, of the topographic map of India, in the April, 1919, *Review* (Vol. 7, p. 280), Lieut.-Col. H. H. Turner, R. E., Superintendent, Map Publication, Survey of India, points out that the maps criticized are provisional issues only, and that they are reproductions by photography of old atlas sheets, pasted together to cover the area of a modern ¼-inch sheet (i. e. on the scale of 1:253,440). These provisional sheets will in time all be replaced by ¼-inch sheets prepared by modern surveys.